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MORTALITY AND MORBIDITY IN MUSLIM POPULATIONS: A FRAMEWORK FOR THE REDUCTION OF THEIR FACTORS

SULAIMAN M. BAH

The best person is he who has a long span of life and his action and conduct is good." Hadith *(Tirmizi).*

Introduction

Definition of a Muslim country

A simple definition of a Muslim country is one whose population comprises 50 percent or more of Muslims. Of these there are 40 in the world according to recent estimates (Weeks, 1988). There are additional seven countries in which Muslims form a significant minority, 25-49 percent. Demographically, however, these Muslim minority countries are more similar to the Muslim majority countries than they are to other developing countries. For this reason, the description 'Muslim country' is used in this paper to include those countries with significant minorities, bringing the total number to 47. All of these countries except for Turkey are either in Asia or Africa. They are also physically contiguous with at least one Muslim country with breaks occurring only in Bangladesh and Tanzania (Weeks, 1988).

Epidemiologic transition in Muslim countries

A useful framework for the analysis of the decline in mortality from high to low levels is the epidemiologic transition theory (Omran, 1971). The theory focuses on the complex changes in patterns of health and disease in a society and on their demographic, socio-economic and biologic determinants and consequences. It proposed that over time, disease patterns shift so that infectious and parasitic diseases are gradually, but not totally displaced by degenerative and man-made diseases as the leading cause of death (Omran, 1983). The theory proposed three major successive stages in the transition: the age of pestilence and famine, the age of receding pandemic and the age of degenerative and man-made diseases. In progressing from one stage

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to another, mortality declines and life expectancy increases. The theory further proposed four models to account for the different variations in pattern, pace and determinants and consequences of population change in different societies (Omran, 1983).

The first model is the classical or Western model which describes the gradual, progressive transition from high to low mortality that accompanied the process of modernization in most western European societies. The second model is the accelerated model which describes the mortality transition similar in pattern to the classical model but was accomplished in a much shorter period. The third is the contemporary or delayed model which describes the relatively recent transition still in process in many developing countries. In these developing countries, substantial declines in mortality started mostly after the 1940's and was largely attributed to modern medical technology such as mass use of chemotherapeutic agents, antibiotics and insecticides. Mortality in these countries is still high, wide socio-economic differentials in mortality still persist and recent evidences show marked slowdown in mortality decline and even stagnation in some cases (Secretariat of the WHO, 1984). The last model is the transitional variant of the delayed model which describes the process of change in certain developing countries where the rate of mortality decline was initially similar to that in the contemporary model and was sustained especially in regard to infant and child mortality. These countries include, Taiwan, South Korea, Singapore, Hong Kong, Sri Lanka, Mauritius, Jamaica, Kerala state in India, Cuba and Costa Rica. Mortality in these countries has approached those of developed countries. A point of note is that none of these countries is a Muslim country and another point is that some of them like Sri Lanka, Kerala state and Mauritius are still developing countries with lower per capita income than many Muslim countries and a last point is that these countries span three continents, Africa, Asia and South America.

The mortality patterns in most of the Muslim countries belong to the contemporary model and are also mostly in the second stage in their epidemiologic transition. This stage is described as one of 'receding pandemic' where life expectancy at birth increases steadily from 30 to 55 years. The major causes of death are as follows:

— Intestinal diseases
— Other infectious diseases
— Airborne diseases
— Maternal causes of death
— Accidents and poisonings
— Behaviourial diseases
— Complex and unexplained causes

By 1988, the average crude death rate for Muslim countries was 13.8 per 1000 population and was 37 percent higher than the other

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non-Muslim developing countries. The average life expectancy at birth for Muslim countries was 55 years compared with 62 years in other developing countries. The infant mortality rate was also 104 per 1000 births compared to 63 per 1000 births in other developing countries (Weeks, 1988). Part of the questions one wishes to address in this paper is the reason for the disparity between the levels of mortality in Muslim countries and other non-Muslim developing countries such as Sri Lanka, Kerala state and Mauritius.

Explanations of factors influencing mortality decline

Mortality is affected by many factors. However, researchers often disagree on which were the most important factors that affected a specific decline. Some of these disagreements have become classic debates. Some of the factors that have been argued to influence mortality decline are:

- Developments in technology such as antibiotics and insecticides
- Improved maternal and child health care
- Improvement in nutrition, water and sanitation
- Progress in socio-economic developmental variables such as, education, inequality, income and accessibility to health care etc. (Meegama, 1985).

For the case of the mortality decline in England and Wales, MacKeown and others (1962, 1972) have argued that the decline in mortality in the eighteenth century and early nineteenth century is largely attributable to increase in food supplies. For the nineteenth century, the main influences for the decline, in addition to food supply, are: a) rising standard of living b) better hygiene and c) favourable trends in the relationship between some micro-organisms and the human host. Medical therapy played little role in the reduction. For the twentieth century however, MacKeown and others (1975) argue that most of the decline is associated with decline in infectious diseases. Their argument for the eighteenth century has been challenged by Razzel (1974). He argues that in the nineteenth century, England had experienced decrease in food consumption per head and hence the argument on improvement in diet cannot hold. He argues instead for the improvement in personal hygiene as being most responsible for the decline during the first half of the nineteenth century. Preston (1975) expressed a similar argument against MacKeown and others. He pointed out to other innovations of germ theory other than drugs. An argument that drugs were not important in the decline does not rule out other innovations of germ theory such as improved antiseptic practice, quarantines and segregation of infectious patients and movement for cleaner foods and water, better sanitation and improved

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infant feeding. Preston and Van der Walle (1978) showed the importance of hygienic factors in their study of urban French mortality in the nineteenth century.

For the modern decline in mortality in the United States in the twentieth century, Mackinlay and Mackinlay (1986) argue that general medical measures, both chemotherapeutic and prophylactic, appear to have contributed little to the overall decline in mortality. The medical interventions were introduced several decades after a marked decline had already set in.

Other researchers have focused on economic factors as being the most important in mortality decline in 'fast decline' countries (e.g. Mauritius, Sri Lanka etc.). Fredericksen (1961) has been one of the leading advocates for this point of view. Fredericksen argues that rise in standards of living was responsible for virtually all of the post-war mortality decline in Sri Lanka. In later papers, he extended this conclusion to British Guiana, Mauritius and then to 21 other countries (Fredericksen, 1966). His arguments regarding Sri Lanka and British Guiana have been refuted by Newman (1965). The relationship between mortality and level of economic development has been investigated by Preston (1975) using cross national data. He concludes that income has been a trivial factor in recent mortality trends but yet is still an important determinant of mortality levels. In short, economic development is necessary but not sufficient for mortality decline. Ruzicka (1986) has given a more thorough review of the important roles played by the different factors to mortality decline in different societies.

One common rule in the explanations of declines in mortality is the recognition of the different phases of declines. Different factors are associated with different phases and when more than one programme has been implemented at any one phase, the identification of the individual roles or effects of the programs become difficult. Among the factors influencing the decline in mortality in Sri Lanka, Meegama (1985) highlights the following as being important: sanitary reforms, maternal and child care, improved nutrition, increase in education, availability of antibiotics and malaria eradication, and health manpower.

Routes to low mortality

While the factors that affect mortality decline are clear to identify, there are several combinations of options to choose from on how best to trigger mortality decline. Several approaches have been adopted in developing countries at different phases of mortality decline. First is the direct approach of using 'vertical intervention' programmes that are disease specific for example immunizations campaigns, spraying of insecticides to reduce malaria incidence etc. This approach is often implemented with the assistance of bilateral organizations like the

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WHO or other non-governmental organizations. Second is the indirect approach. The principle behind this approach is that mortality will be reduced indirectly by focusing on social and economic development and social equity. This approach affects factors already mentioned such as education, income, health care etc. The third approach can best be termed as 'restructuring of the society'. This takes the form of increasing egalitarianism and populism, increasing female autonomy, establishment of open political systems and elimination of rigid class structure (Caldwell, 1986).

Part of the difference in the rates of mortality decline between many developing countries belonging to the delayed model and those belonging to the accelerated variant of the delayed model is that the former stopped at the first approach while the later proceeded to implement the second and third approaches, in whole or in parts. There are however certain costs involved in adopting the second and third approaches. For the second approach, there is need for major investment and many Muslim countries especially the non-oil producing ones are mostly in debt and cannot adequately adopt this approach. The third approach includes some elements that contradict Islam, namely that of increasing female autonomy and egalitarianism and populism. Countries where female autonomy have been increased also have low degree of morality and high rates of extra marital relations. Proponents of increasing female autonomy do not consider the negative aspects that the move carries with it. Egalitarianism and populism are similar to socialism which is a political system not favoured in Islam.

A fourth approach which is not mentioned in literature and which this paper wishes to address is the Islamic approach which is based on the implementation of the Qur'an and the tradition of the Prophet Muhammad (p.b.u.h.), the *Sunnah*. This approach incorporates the best of the second and third approaches, is the least expensive to adopt and has the most lasting effect.

The Islamic route to low mortality

The Islamic route to low mortality operates on both the societal and individual levels thereby imposing duties on both the government and the individual Muslims. On the societal level, the *Shari'ah* enforces justice and equality. When implemented, it has the following implications for health and mortality:

1. A high priority is given to the provision of the basic needs of food, clothing and shelter. The failure to meet these needs are some of the factors contributing to high rates of morbidity and mortality and in their persistent wide socio-economic differentials. The Prophet (p.b.u.h.) is reported to have said to the effect that each person has a right to a place to sleep, a

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piece of clothing to wear and a piece of bread to eat.

2. Equality in access to health services instead of skewed distribution that favours one population subgroup and disfavours the other. The Prophet (p.b.u.h.) is reported to have said:

'... Nobody has superiority over another except by piety and good action ...'.

3. The mechanism of stopping wrong at the inception rather than at the end (e.g. forbidding advertisements for drinking and their importation, forbidding all forms of lewdness and vice) and hence avoiding factors that lead to deaths which can be directly attributed to government policy or to its lax moral stand.

On the individual level, the Islamic prescriptions embodied in the Qur'an and *Sunnah* are both curative and preventive and each employs two approaches:

— **The material approach** (for illnesses related to the body)
— **The spiritual approach** (for illnesses related both to the body and the psyche)

The first approach can be seen as rooted in germ theory and biomedically verifiables. Examples are the curative properties of honey, the harmful aspect of pork etc. This approach has been favoured by many Muslim medical doctors as it does not contradict or pose a threat to the causal mechanism paradigm in which they operate.

The second approach directly involves the Qur'an in the form of recitation of specific *ayat* or the recitation of *du'as* from *hadith* as curative or preventive measures. It also incorporates the involvement of *jinn* and 'evil eye' in its causal mechanism. This approach has been underplayed and is probably not favoured by many Muslim medical doctors. It lies outside the causal mechanism paradigm in which they were trained and also appears to pose a direct threat to it. Many also confuse this approach with traditional medicine. There is marked difference between the two. In most cases traditional medicine is undocumented and is shrouded in mystery and largely unverifiable. On the contrary, the spiritual approach is well documented, not shrouded in mystery and has given successful results as documented in the life of the Prophet (p.b.u.h.), his Companions and even in contemporary times.

Tables 1 and 2 give a summary of some of the preventive prescriptions from the Qur'an and *Sunnah* using both approaches.

These tables are just short summaries of some preventive Islamic prescriptions. With the exceptions of honey and black seed (*Nigella sativa*) which are curative, Table 1 deals mostly with preventive

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practices, the list however is far from complete. For the curative aspects, there are other *ahadith* that recommend specific cures for certain diseases, for example, the use of Indian incense to heal tonsillitis and the use of the water of *manna* plant to cure eye diseases etc. The paper however does not consider specific diseases but rather broad groups of causes of death or illnesses. Table 2 covers either illnesses that are not recognized by modern medicine (e.g. spiritual diseases of the heart or diseases caused by 'evil eye') or cures that are not rooted in germ theory (e.g. supplications or *ruqya*), it has therefore been described as the spiritual approach.

These prescriptions are not meant to replace the cures derived from modern medicine. Islam does not oppose some of the methodologies (e.g. diagnosis) and achievements of modern medicine for several reasons. Firstly, man is urged to seek cure for his diseases, for indeed there is cure for every disease except death; we might or might not know of it. Secondly, all knowledge comes from Allah (SWT) and Muslims are urged to pursue *'ilm* (knowledge). Thirdly Muslims were actually the forerunners of modern medicine.

However some reservations are in place. Modern medicine has become highly capitalistic and capital intensive and has become highly secular. Many poor Muslim countries can hardly afford to buy some of the expensive medical equipments. Another reservation about modern medicine is that it has become highly secular in that it does not accept prescriptions from religious sources that cannot be subjected to biomedical verification.

Using this approach, every practice, good or bad, is rejected until it has been medically verified. One example of the failure of this approach is the case of breast feeding and bottle feeding. When medical practitioners could not prove the benefits of breast feeding, they gave the go ahead to bottle feeding and this became so popular as to almost replace breast feeding. Among several advantages of breast feeding, it has been found that the practice provides dramatic level of protections against diarrhoea in infants. Galway and others (1987) cite the case of a study in Costa Rica where it was found that the infants who were exclusively bottle-fed in the first 6 months of life contracted diarrhoea at 4 times the rate of partially breast-fed infants and almost 7 times the rate of exclusively breast-fed infants. Some of the benefits of breast feeding have been 'discovered' (after many children have died of diarrhoea acquired through bad bottle feeding practices) and now it is being actively promoted. The incorporation of modern medicine within an Islamic framework will be a very useful endeavour.

Part of the aim of this paper is to recommend cheaper ways of mortality and morbidity reduction from an Islamic point of view. For this reason, the emphasis is on simple remedies that have been mentioned in the Qur'an and *Sunnah* and which are applicable at both the individual and the societal levels. Many Muslim countries are

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TABLE 1
MATERIAL APPROACH

Cause of Death/ Illness	Preventive Prescription	Source
1. Intestinal causes	a) Washing of hands before and after eating	ABD, TIR
	b) Using right hand for eating and left hand for cleaning	ABD
	c) Washing of hands after privy and after sleep	BUK, MUS, ABD
	d) Covering of food	
	e) Eating honey	BUK
2. Other infectious diseases	a) Personal hygiene	IH
	b) Not urinating in stagnant water	MUS
	c) Eating pure food	Q 2:168
	d) Avoiding pork	Q 16:115; 5:4; 2:173
3. Airborne diseases	a) Covering food	BUK, MUS
	b) Covering sputum	MUS
4. Maternal causes of death	a) 2-2.5 years of breast feeding	Q 31:14; 46:15
	b) Long birth interval	Q 31:14; 46:15
5. Accidents and poisoning	a) Walking slowly	
	b) Eating seven *'Ajwa* dates to prevent poisoning	BUK
	c) Putting off fire before going to sleep	BUK, MUS
	d) Removal of harmful things from the way	BUK, MUS
6. Diseases due to lifestyle and behavioural factors	a) Avoiding intoxicants and drugs	Q 2:219; 5:91
	b) Avoiding habits that results in killing of oneself like smoking	Q 4:29; 2:195
	c) Avoiding of sex outside marriage	Q 17:32
	d) Avoiding homosexuality	Q 26:165-166
	e) Avoiding overeating	BUK
	f) Fasting	Q 2:183
	g) Prayer	
7. Complex and unexplained cases	a) Eating black seed	BUK
	b) Fasting	Q 2:183

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TABLE 2
Spiritual Approach

Cause of Death/ Illness	Preventive Prescription	Source
1. Diseases of the heart (spiritual)	a) Reading the Qur'an b) Supplication (*du'a*)	Q 10:57 TIR
2. Accidents (scorpion bite)	a) *Ruqya*	BUK
3. Evil eye	a) *Ruqya*	BUK
4. Magic	a) Eating seven *'Ajwa* dates in the morning	BUK
5. Psychological	a) Supplication	TIR

Key to abbreviations used:

Q	=	Qur'an
BUK	=	Bukhari collection of *Ahadith*
ABD	=	Abu Daw'ud collection of *Ahadith*
AHM	=	Imam Ahmad collection of *Ahadith*
TIR	=	Tirmizi collection of *Ahadith*
MUS	=	Imam Muslim collection of *Ahadith*
IH	=	Ibn Hayyan

caught in a dilemma: They have not adopted the second approach (indirect) to improve mortality conditions partly due to the lack of resources. They have also not adopted the third approach (restructuring of the society) partly due to the oppression of the political regimes in power and partly because of opposition to un-Islamic ways of restructuring the society. They have also not adopted the fourth approach (Islamic approach) at the societal level due to the colonial legacy of secularization, the opposition to the implementation of *Shari'ah* (both internal and external), the fascination with the West and the failure to see Islam as a self sufficient and complete way of life. Many Muslim countries have been stuck at the first approach (direct approach) to mortality reduction which itself cannot suffice if low mortality is to be achieved.

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Framework for the implementation of health model based on the Qur'an and *Sunnah*

A novel concept in health care in the developed countries in health promotion. This is defined as:

> 'The process of enabling people to increase control over, and to improve, their health'.

This concept portrays health as a part of everyday living. Health ceases to be measured strictly in terms of illness and death and of curing illness and injuries. Health is viewed as basic and dynamic force in individuals' lives and is influenced by circumstances, beliefs, culture, socio-economic and physical environment. This is a marked shift from a bio-medical to a socio-medical approach to viewing health. It is also indirectly acknowledging that religion which covers beliefs and culture and social well-being has a direct role to play in health promotion. Developing countries are yet to catch with this new perspective.

The first requirement for Islamic health promotion is to form a coordinating group, 'Islamic Health Promotion Group'. This group is to comprise of useful bodies like the Ministries of Health, Islamic Affairs, Education and Information. This implementation of a health model based on Qur'an and *Sunnah* in Muslim countries is likely to face a few problems. First is the secularization in school curricula. Even Islamic schools have not been able to teach various subjects from the Islamic perspective rather they end up appending Islamic subjects to the other subjects offered in non-Islamic schools without an integration of the two. The second problem might come from western-trained doctors who might tend to underplay any medical claims outside of germ-theory and might tend to confuse this approach with traditional medicine and superstition.

For these reasons, the first stage in the implementation of the model is from bottom upwards rather from top to bottom. According to Preston (1986):

> "Knowledge of proper health care practices can be spread from person to person or from a 'central source' such as the mass media without any formal involvement of the formal educational system."

The first stage therefore in the implementation of the model is the dissemination of information. Information on Islamic health promotion based on both the material and the spiritual approaches should be disseminated through the radio, television, the press, posters, leaflets, seminars and awareness campaigns. The second stage is training of Islamic teachers and *imams*. The last stage is

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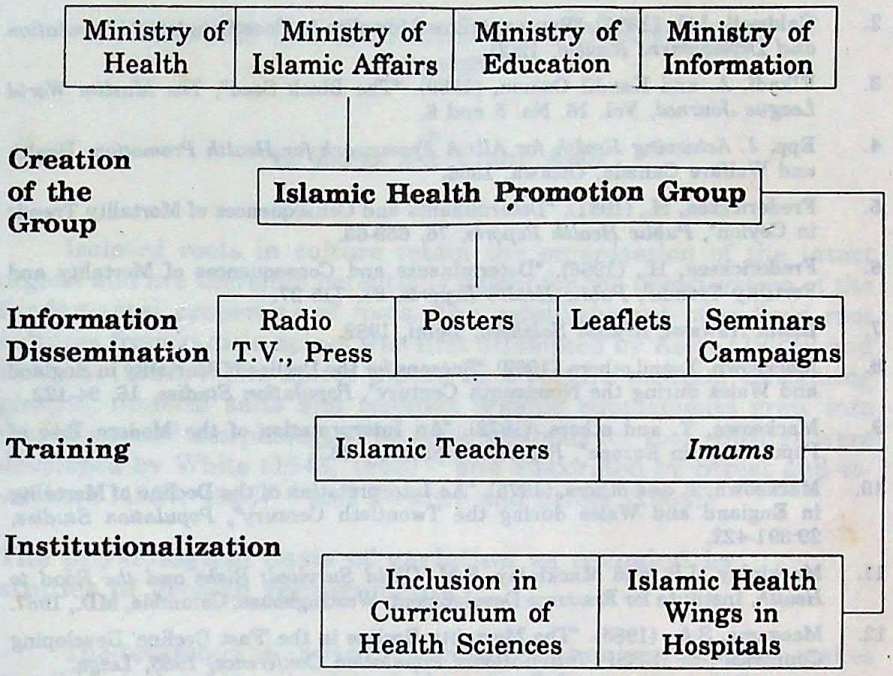
FRAMEWORK FOR THE IMPLEMENTATION OF HEALTH MODEL BASED ON QUR'AN AND *SUNNAH*



institutionalization of Islamic health promotion. This can be achieved through the inclusion of the Islamic perspective on health in the curricula of the health sciences and the creation of Islamic health wings in the hospital. I believe that *Insha' Allah,* this can lead to rapid reductions in the factors affecting morbidity and mortality, it will be cheap to implement and will also be rewarding in the Hereafter as it will be part of worship.

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REFERENCES

1. Bellam Khadar, J., (1989). "A New Look at Traditional Medicine in Morocco", *World Health Forum*, Vol. 10.
2. Caldwell, J.C., (1986). "Routes to Low Mortality in Poor Countries", *Population and Development Review*, 12(2).
3. Elkadi, A. and Kandil Osman, (1989). "The Black Seed", *The Muslim World League Journal*, Vol. 16, No. 5 and 6.
4. Epp, J. *Achieving Health for All: A Framework for Health Promotion*, Health and Welfare Canada, Ottawa, 1986.
5. Fredericksen, H., (1961). "Determinants and Consequences of Mortality Trends in Ceylon", *Public Health Reports*, 76, 659-63.
6. Fredericksen, H., (1966). "Determinants and Consequences of Mortality and Fertility Trends", *Public Health Reports*, 81, 715-27.
7. Imam Nawawi, *Riyadh Saleheen*, Delhi, 1989.
8. Mackeown, T. and others, (1962). "Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century", *Population Studies*, 16, 94-122.
9. Mackeown, T. and others, (1972). "An Interpretation of the Modern Rise of Populations in Europe", *Population Studies*, 26.
10. Mackeown, T. and others, (1975). "An Interpretation of the Decline of Mortality in England and Wales during the Twentieth Century", *Population Studies*, 29:391-422.
11. Mackinlay, J.B. and Mackinlay, S.M. *Child Survival: Risks and the Road to Health*, Institute for Resource Development, Westinghouse, Columbia, MD., 1987.
12. Meegama, S.A., (1985). "The Mortality Decline in the 'Fast Decline' Developing Countries", in IUSSP, *International Population Conference, 1985*, Liege.
13. Newman, P. *Malaria Eradication and Population Growth: with Special Reference to Ceylon and British Guiana*, Research Series No. 10, Ann Arbor, Michigan, Bureau of Public Health Economics, School of Public Health, University of Michigan, 1965.
14. Omran, A.R., (1972). "The Epidemiologic Transition", *Milbank Memorial Fund Quarterly*, XLIX (Part 1), pp. 509-38.
15. Preston, S., (1975). "The Changing Relation between Mortality and Level of Economic Development", *Population Studies*, Vol. 29.
16. Preston and Van der Walle, (1978). "Urban French Mortality in the Nineteenth Century", *Population Studies*, Vol. 32(2).
17. Razzel, P.E., (1974). "An Interpretation of the Modern Rise of Populations in Europe", *Population Studies*, Vol. 28.
18. Ruzicka, L.T., (1986). "The Elusive Paths of Mortality Transition", in H. Hansluwka and others (eds.), *New Developments in the Analysis of Mortality and Causes of Death*, Amarin Press, Bangkok.
19. Secretariat of the W.H.O., "Policies and Programmes Affecting Mortality and Health", in United Nations (1984), *Mortality and Health Policy*, New York, NY, 1984.
20. Shahid, Athar, *Islamic Medicine*, Pan-Islamic Publishing House, Karachi, 1989.
21. Weeks, John R., (1988). "The Demography of Islamic Nations", *Population Bulletin*, Vol. 43, No. 4.

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STUDIES ON EXCISED ROOT CULTURE
A REVIEW

R. ZAFAR AND VIDHU AERI

Isolated roots in culture retain the organisation of the intact organs and are therefore potentially useful for the investigation of the fundamental properties of roots. The establishment of excised root cultures from radicle apices was first attempted by Kotte (1922)[1] and Robbins (1922)[2]. The apices placed in a culture medium containing glucose, mineral salts and complex organic supplements grew into root of normal morphology. The basic methods for root cultures were developed by White (1943, 1963)[3,4] and elaborated by Street and co-workers (1957, 1966)[5,6] and Butcher and Street (1964)[7].

The physiological basis of variation as revealed by studies of growth requirements

The technique of excised root culture not only reveals but makes possible study of the physiological basis of the marked differences in growth behaviour between roots of different species, strains and individuals. These differences appear to arise primarily from differences in requirements for an external supply of specific growth factors or metabolites.

1. Vitamin responses

Bonner (1940)[8] and Bonner and Devirian (1939)[9] have studied the requirements of the excised root of ten species for the B Vitamins: thiamine, pyridoxine and niacin. They were able to classify the species into four groups according to the minimum vitamin combination giving the full growth rate; those requiring thiamine only (e.g. flax), those requiring thiamine + niacin (e.g. pea, radish, alfalfa, clover), those requiring thiamine + pyridoxine (e.g. carrot) and those requiring all three of the vitamins (e.g. tomato, sunflower, *Datura*). It was concluded that all three of the B Vitamins were essential for root growth and were also responsible for the activity of yeast extract in promoting the growth of excised roots of tomato and of other species in culture.

There is evidence that excised roots actively synthesize other vitamins of the B complex. Biotin is abundantly synthesized by roots

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of flax, white clover, alfalfa, tomato (Bonner, 1940)[8] and pea (Louis, 1950)[10]; riboflavin by roots of white clover, alfalfa, tomato, *Datura* and sunflower (Bonner, 1942)[11] and p. amino benzoic acid by tomato roots (Bonner, 1942).[11] It may be that vitamin requirements of all excised roots will be met by the three B vitamins now incorporated in standard root culture media (White, 1943)[3]. The work of Robbins, Whalley and Long and Boll does, however, emphasize that excised roots from different varieties of tomato do differ markedly in their responses to B vitamins indicating, in all probability, that the root cells differ quantitatively in their abilities to synthesize these essential growth factors.

2. *Amino acid responses*

Excised roots supplied with an optimum supplement of B vitamins are in general insensitive to low concentrations of complex supplements containing amino acids such as yeast extract and casein hydrolysate and are inhibited by such mixtures at higher concentrations. Individual amino acids vary markedly in their toxicity to excised root growth; among the least toxic are arginine, phenylalanine, aspartic and glutamic acids and their amides; among the most toxic are leucine, isoleucine, serine and valine. Recent work has shown that roots which grow poorly in nutritive media may be markedly stimulated in growth by exogenous amino acids.

The growth rate and lateral formation are markedly stimulated by the addition of 'Difco' yeast extract. A 'synthetic yeast extract' reproduced the growth stimulation of the original extract. It was shown that the lysine and arginine of the extract were the major constituents responsible for the growth stimulation. These amino acids were shown not only to antagonize the quite marked toxicity towards groundsel roots of the 3 mg/L glycine present in White's medium, but to be stimulatory in the absence of glycine. Optimum growth was obtained in media containing glycine together with arginine or lysine.

The stimulatory activity of arginine and lysine could be replaced by ornithine or citrulline, but not by any other amino acids. Subsequent work by Charles (1956)[12] on groundsel has confirmed that arginine and lysine antagonize the toxicity of glycine and show with it a synergistic effect.

3. *Auxin responses*

Robbins (1922)[13] and Robbins and Maneval (1924)[14] showed that maize root growth in culture was improved by the addition of autolysed yeast or peptone but with each subculture the growth rate declined and the diameter of the roots decreased. Later various workers altered the nature and concentration of the carbohydrate, inorganic and vitamin constituents and added as supplements to the standard media

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amino acids, vitamins and complex supplements such as yeast extract, protein hydrolysate and endosperm extract. The high rates of growth were achieved during the first few days but the decline and ultimate cessation of excised root growth was not prevented. This strongly suggested that the subsequent cessation of growth was not a consequence of injury inflicted by excision of the radicle apices or inadequate oxygen supply or of a toxicity in the medium.

Roberts and Street (1955)[15] established a clone of rye roots in continuous culture and demonstrated that the growth stimulating activity of natural yeast extract to rye roots depends upon its content of L-tryptophan. Both – indolylacetic acid (IAA) and ß-indolyl acetonitrile (IAN) were of equal growth promoting activity. This strongly pointed to the amino acid acting as an auxin precursor.

The work described above represented the first demonstration of that the continuous culture of excised roots could require an exogenous supply of auxin or auxin precursor. In 1936, Fiedler claimed that auxin was present in the roots of maize plants but was absent from excised maize roots within a short time of placing them in culture. Nagao (1937, 1938)[16, 17] claimed that he could detect auxin 12 days after establishment of *Helianthus* and maize culture. The view that there is a marked fall in auxin content following excision and culture is supported by Van Overbeek and Bonner (1938).[18]

The direct effect of adding yeast extract to the standard medium was principally to increase the number of lateral roots initiated. Roots pretreated with yeast extract supplemented medium showed, during the passage in arginine medium, a marked improvement in linear growth of main axis and laterals and in number of laterals as compared with roots in their second passage in arginine medium. Both the 'direct' and 'indirect' effects of yeast extract on the roots of the 'Czechoslovakian' strain could be reproduced by tryptophan, the effect of which could be enhanced by the addition of methionine.

Work proceeding simultaneously prompted the testing of the responses of these groundsel roots to the naphthoxy-acetic acids. 1-naphthoxy acetic acid, although failing to enhance growth values directly, caused an indirect stimulation while 2-naphthoxy acetic acid not only increased the number of laterals but in addition showed a marked stimulation of linear growth.

These results, obtained by Charles (1956)[12] with the 'Czechoslovakian' strain, could be accommodated by the hypothesis that the roots in culture develop only a limiting concentration of an essential natural growth hormone and that the growth stimulating substances, with varying efficiencies, made good this hormone deficiency. The different behaviour of the roots of the strains in culture is determined by their different and suboptimal contents of a natural growth substance.

The work reviewed above therefore strongly suggests that the growth of excised roots derived from cereals and from certain dicot

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species is limited in culture by the rate of synthesis of essential growth hormone(s) or auxin(s). Excised roots in which it is postulated that the natural auxin level is sub-optimum can clearly grow rapidly and develop abundant laterals, or show a good level of main axis extension but poor lateral development, or grow very poorly and be devoid of laterals. Reduction in lateral initiation and ultimately of main axis extension growth would seem to be symptoms of increasing auxin deficiency. Examination of the techniques adopted for the subculture of the roots of those dicot species whose growth can be stimulated by exogenous auxin reveals that their main axis tips have proved capable of repeated subculture without loss of activity.

The development of auxin deficiency does not, however, occur in all root cultures. The excised roots of tomato cannot be stimulated by exogenous IAA or IAN; these substances are either without effect or inhibitory to their growth (Street, McGregor and Sussex, 1954)[19]. When roots were allowed to continue growth without subculture in a large volume of medium containing complexed iron or in constantly renewed medium, the main axis meristems ceased growth whilst the more recently initiated lateral meristems were still growing actively (Street and Roberts, 1952)[20].

It was then shown (Street, 1954)[21] that -indolyl acetic acid reduced the survival of main axis meristems when repeatedly subcultured, but that the anti-auxin -(1-naphthylmethyl-sulphide) propionic acid (NMSP) at appropriate concentration stimulated growth and markedly enhanced survival. Further experiments (Street, 1955)[22] showed that the auxin, 1-naphthalene acetic acid accelerated the loss of meristematic activity and that, unlike IAA, concentrations initially without a depressing effect on growth not only depressed survival but became progressively more inhibitory as the meristems were repeatedly subcultured.

These results suggested that the retardation of growth and eventual cessation of meristematic activity, the 'ageing' and inactivation of meristems, observed when excised tomato roots are allowed to continue growth in an abundant supply of medium or are repeatedly subcultured by excision of the same meristem, is due to the accumulation at the apex of some natural auxin to a critical supra-optimal concentration. Enhancement of the survival of activity resulting from repeated excision was considered to be a consequence of interrupting the supply to the apex of this auxin or its precursor synthesized in the mature cells or lateral primordia of the tip of the root. Of the auxins tested, 1-naphthalene acetic acid (NAA) most nearly reproduced the symptoms characteristic of the natural 'ageing' process as expressed in root growth and morphology. The effect on growth and survival of IAA and IAN (Street, 1954)[21] strongly suggested that neither was identical with the natural auxin controlling meristematic activity in the exercised tomato root meristems.

These studies emphasize the importance of auxin metabolism in

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the variation between excised root cultures from different species and varieties. They add interest to the fact that the best evidence at present available for a mutation in culture (Street and McGonagle, 1953)[23] relates to a case of changed survival expectation on repeated subculture of the main axis meristem, probably therefore to a change in auxin metabolism.

Differentiation in excised roots

1. *Division, expansion and maturation of root cells*

The organisation of the apical meristems of cultured roots as examined by microscopy corresponds well with that of the seedling radicle apices of the species (Street and McGregor, 1952; Heimsch, 1960)[24, 25] and it is clear that their lateral apices reach full size and growth activity only after several days of growth in culture following their emergence. The pattern in the arrangement of cells in the apical root meristem is determined by the planes along which division walls are laid down in cell division and by a balanced relationship between cell division and cell expansion. When the rate of cell division in root meristems is reduced by auxins, the regular polarity of the meristem cells is disturbed. This suggests the possible importance of diffusion patterns of natural auxins in the maintenance of the normal pattern of polarity in the root apex.

By studying the growth rate and by recording the cell dimensions at known distances from the root apex, the time course of cell expansion in the different cell layers can be calculated. Burstrom (1954, 1955)[26, 27] revealed that cell expansion takes place in two phases. The first phase is regarded as involving a plastic stretching of the wall independent of calcium and promoted by auxin, and the second phase, calcium requiring and inhibited by auxin, as involving the deposition of cellulose. Studies by Brown and his co-workers (1950, 1955)[28, 29] revealed that with cell expansion there was a progressive increase, on a per cell basis, in respiration, in protein content and in the activities of enzymes. There was a parallel increase in total RNA per cell. It has been suggested that only part of the RNA may be of significance in the control of cell expansion and differentiating via protein synthesis. The development of such studies should open up the possibility of following the flow of genetic information during cell expansion and differentiation in the cells of roots growing under a range of cultural conditions.

2. *Lateral initiation*

Lateral root primordia in cultured roots arise in the pericycle at positions related to the primary xylem poles of the central cylinder. The extent to which laterals are developed by cultured roots varies

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markedly between species and between strains within species. Lateral productions in the strains showing poor lateral development can be markedly enhanced by appropriate auxin treatment, both IAA and the synthetic auxin, 2-NOA being effective. Torrey (1956) reported that thiamine, niacin, adenine, certain mineral irons are essential for lateral development.

3. *Vascular patterns*

Torrey (1954, 1955)[30,31] has succeeded in growing pea roots in culture from very small root tips. Such tips had no mature tissues or recognisable vascular pattern but they developed into roots of normal anatomy except that most of them were di-or monarch instead of triarch, the typical condition. So, organisation within the apical meristem determines the vascular pattern.

Dormer and Street (1948)[32] in investigating the anatomy of excised tomato roots which had been kept several months in small volumes of medium, found no organised development of secondary vascular tissues but only disorganised cambial activity within the stele and differentiation of lignified xylem elements from some of the cambial derivatives. Torrey (1951)[33] found that, following decapitation of cultured pea roots, cell divisions occurred in the stele of the root stump, to an extent which could, in individual instances, double the root diameter and that such roots contained increased number of xylem elements. These results suggest that, in culture, some substance(s) essential for the development of vascular cambium are depleted and that this depletion is enhanced by the presence of dicotylised plumule when seedlings are cultured in darkness.

Initiation of vascular cambium and differentiation of its products into vascular units may depend not only upon the presence of essential growth regulators and nutrients in the root but also upon their internal distribution. Thus, in excised tomato roots, IAN inhibits cell division at the apical meristem and initiation of lateral primordia, does not markedly inhibit cell expansion, and causes generalised division in the pericycle, leading to an enhanced number of cells in the stele, some of which give rise to secondary xylem vessels. By contrast, IAA at similarly inhibitory concentrations does not markedly reduce the rate of cell division at the main tip meristem, enhances the initiation of lateral primordia, strongly inhibits cell expansion and does not promote generalised divisions in the pericycle. (Street, McGregor and Sussex, 1954; Hughes and Street, 1960)[34].

Isolated roots have also been studied for their ability to biosynthesize following plant metabolites:

1. **Alkaloids:** Bothner *et al.*, 1962[35]; Dawson, 1942[36], 1960[37], Dawson *et al.*, 1960[38]; Evans and Griffin, 1962[39]; French and Gibson, 1957[40]; Gibson and Abbott, 1963[41]; Gibson and

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French, 1964[42]; Grass and Schutte, 1963[43]; Reinouts van Hag, 1956[44]; Solt, 1957[45], Solt *et al.*, 1960[46]; Steinstra, 1954[47]; Telle and Gautheret, 1947[48]; West and Mika, 1957[49].

2. **Glycosides:** Ben-Yehoshua and Conn, 1964[50]; Mothes and Kala, 1955[51]; Sargent and Skoog, 1960[52], 1961[53].
3. **Coumarins:** Mothes *et al.*, 1956[54]; Routien and Nickell, 1956[55]; Weygand and Endt, 1959[56]; Williams, 1963[57].
4. **Phenolics:** Smith, 1961[58].
5. **Amino acids:** Zafar *et al.*, 1989[59].

The authors have been able to develop and maintain the root cultures of *Allium sativum, Trigonella foenum-graecum, Ipomoea muricata* and *Artemisia annua* (Figs. 1-4).

Hairy root culture

Hairy roots are hormone autonomous roots obtained by transformation with *Agrobacterium rhizogenes*. Their biosynthetic potentials are being explored in several laboratories. A massive increase of biomass over relatively short periods of culture and complete

Fig. 1
Root Culture of *Allium sativum* grown in Street and McGregor medium + Vitamins (Aneurine HCl-0.5 mg/L. Glycine 3.6 mg/L, pyrodoxin-0.1 mg/L and nicotinic acid 0.5 mg/l.

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Fig. 2
Root Culture of *Trigonella foenum-graecum* grown in Street and McGregor medium + Vitamin.

Fig. 3
Root Culture of *Ipomoea muricata* Linn., grown in Street and McGregor medium + yeast extract (50 mg/L) + Vitamins.

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Fig. 4
Root Culture of *Artemisia annua* grown in Street and McGregor medium and casein hydrolysate (100mg/L) + Vitamins.

differentiation of root tissue warrant the production of root-specific phytochemicals at substantial levels. And, indeed, hairy root cultures may become raw material for industrial processes towards pharmaceuticals or flavors or pigments. A few examples may illustrate the potential of hairy root cultures. They permit us to obtain compounds which occur in native roots in traces only. Hairy root cultures of opium poppy produced sanguinarine at levels up to 2% of dry weight.[60] Also hairy root cultures may equal the productivity of native roots and exceed other *in vitro* systems as with red thiarubrines, strong antibacterial and antifungal compounds in *Chaenactis douglasii*[61, 62]. Finally, a survey of the potential of 24 solanaceous species showed tropane levels in hairy roots similar to those in native roots[63]. Analysis of hairy roots of a *Datura candida* hybrid furnished yields of 0.68% of dry weight which is 1.6 and 2.6 times the amount found in the aerial parts and in the roots of parent plants, respectively. Scopolamine was the principal alkaloid and the scopolamine/hyoscyamine ratio of 5:1 makes these hairy root cultures subject to considerations as a source of scopolamine.[64]

Cell cultures and hairy root cultures would gain in importance as source of pharmaceuticals if products including desirable compounds would be released into the medium and enable continuous, on-line, non-destructive harvest procedures. Forced release by organic solvent as applied once to immobilized cells[65] has not been found satisfactory.

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The poration of cells as generally practised with protoplasts for purposes of DNA incorporation[66] would appear to be impractical at this time. A better prospect would appear to result from observation of active excretion of berberine by cell cultures of *Thalictrum minus*[67]. Subsequent experimentation admittedly showed that excretion of berberine differed with *Thalictrum* species and appeared to be largely under genetic control.[68] While these observations and conclusions could prevent further studies today, they may in future become subject to genetic manipulation and widen the range of material designed to excrete desirable products.

Conclusion

The present status of the excised root culture technique should, in the immediate future, permit of rapid expansion of our knowledge of the physiological basis and genetic control of the natural variation expressed in the growth requirements and physiological responses of excised roots.

REFERENCES

1. Kotte, W. *Ber. Deut. Bot. Ges.*, 1922, 40, 269.
2. Robbins, W.J. *Botan. Gaz.*, 1922, 73, 376.
3. White, P.R. *A Handbook of plant tissue culture*, J. Cattell, Lancaster, Pa., 1943.
4. White, P.R. *The cultivation of animal and plant cells*, 2nd ed., Ronald Press, New York, 1963, pp. 288.
5. Street, H.E. *Biological Reviews*, 1957, 32; 117.
6. Street, H.E. and Hensha, G.G. *Introduction and Methods employed in plant tissue culture, cells, and tissues in cultures*, Vol. 3, Academic Press, London, 1966, pp. 459.
7. Butcher, D.N. and Street, H.E. *Botanical Review*, 1964, 30, 513.
8. Bonner, J. *Am. J. Botany*, 1940, 27, 692.
9. Bonner, J. and Devirian, P.S. *Amer. J. Bot.*, 1939, 26, 661.
10. Louis, R. *Experimentia*, 1950, 6, 145.
11. Bonner, J. *Proc. Nat. Acad. Sci.*, Wash, 1942, 28, 32.
12. Charles, H.P. Ph.D. thesis, Univ. of Manchester, 1956.
13. Robbins,, W.J. *Botan. Gaz.*, 1922, 74, 59.
14. Robbins W.J. and Maneval, W.E. *Botan. Gaz.*, 1924, 78, 424.
15. Roberts, E.H. and Street, H.E. *Physiol. Plant*, 1955, 8, 238.
16. Nagao, M. *Sci. Rep. Tohoku Univ., (Biol.)*, 1937, 12, 191.

Channel eGangotri Urdu

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17. Nagao, M. *Sci. Rep. Tohoku Univ. (Biol.),* 1938, 13, 221.
18. Overbeek, J. Van, Bonner, J. *Proc. Nat. Acad. Sci.,*Wash., 1938, 24, 260.
19. Street, H.E., McGregor, S.M. and Sussex, I.M. *J. Exp. Bot.,* 1954, 5, 204.
20. Street, H.E. and Roberts, E.H. *Physiol. Plant.,* 1952, 5, 498.
21. Street, H.E. *Discovery,* 1954, 14, 286.
22. Street, H.E. *Physiol. Plant,* 1955, 8, 48.
23. Street, H.E. and McGonagle, M.P. *Physiol. Plant,* 1953, 6, 707
24. Street, H.E. and McGregor, S.M. *Ann. Bot.,* 1952, 16, 185.
25. Heimsch, C. *Amer. Bot.,* 1960, 47, 195.
26. Burstrom, H. *Physiol. Plant.,* 1954, 7, 548.
27. Burstrom, H. *Bot. Nat.,* 1955, 108, 400.
28. Brown, R. and Broadeent, D., *Exp. Bot.,* 1950, 1, 249.
29. Brown, R. and Robinson, E., In Butler, E.G. (ed.) *Biological specificity and growth,* Princeston Univ. Press, 1955, 95.
30. Torrey, J.G. *Plant Physiol.,* 1954, 29, 279.
31. Torrey, J.G. *Amer. Bot.,* 1955, 42, 183.
32. Dormer, K.J. and Street, H.E. *Nature (Ion),* 1948, 161, 483.
33. Torrey, J.G. *Amer. Bot.,* 1951, 38, 596.
34. Hughes, E.W.D. and Street, H.E. *J. Exp. Bot.,* 1960, 11, 198.
35. Bothner – By A.A. Schutz R.S., Dawson, R.F. and Solt, M.L. *J. Am. Chem. Soc.,* 1962, 84, 52.
36. Dawson, R.F. *Am. J. Botany,* 1942, 29, 813.
37. Dawson, R.F. *Am. Scientist,* 1960, 48, 321.
38. Dawson, R.F., Christman, D.R. D'., Adamo, A., Solt, M.L. and Wolf, A.P. *J. Amer. Chem. Soc.,* 1960, 82, 2628.
39. Evans, W.C. and Griffin, W.J. *Lloydia,* 1962, 25, 139.
40. French, D.I. and Gibson, M.R. *J. Amer. Pharm. Assoc., Sci.,* Ed., 1957, 48, 151.
41. Gibson, M.R. and Abbott, R. *Lloydia,* 1963, 26, 125.
42. Gibson, M.R. and French, D.I. *Lloydia,* 1964, 27, 47.
43. Grass, D. and Schutte, H.R. *Arch. Pharm.,* 1963, 296, 1.
44. Reinouts van Hag, P. *Deut. Akad. Wiss. Berlin Kl. Chem. Geol. Biol.,* 1956, 7, 102.
45. Solt, M.L. *Plant Physiol.,* 1957, 32, 480.
46. Solt, M.L., Dawson, R.F. and Christman, D.R. *Plant Physiol.,* 1960, 35, 887.
47. Steinstra, T.M. *Proc. Koninki Ned. Aka. Wetenschap.,* 57(c), 1954, 584.
48. Telle, J. and Gautheret, R. *Compt. Rend.,* 1947, 224, 1653.
49. West, R., Jr. and Mika, E.S. *Botan. Gaz.,* 1957, 119, 50.
50. Ben-Yehoshua, S. and Conn, E.E. *Plant. Physiol.,* 1964, 39, 331.
51. Mothes, K. and Kala, H. *Naturwise,* 1955, 42, 159.
52. Sargent, J.A. and Skoog, F. *Plant Physiol.,* 1960, 35, 934.

Channel eGangotri Urdu

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53. Sargent, J.A. and Skoog, F. *Physiol. Plant.*, 1961, 14, 504.

54. Mothes, K., Ramsorn, K., Engelbercht, L. and Wagner, A.N. *Naturwiss*, 1956, 43, 358.

55. Routien, J.B. and Nickell, L.G. *U.S. Pat.*, 2, May 29, 1956, 747, 334.

56. Weygand, F. and Endt, H.Z. *Naturioroschung*, 1959, 14(b), 421.

57. Williams, L.G. M.S. Thesis Univ., Nebraska, Lincoln, 1963.

58. Smith, F.H. *Nature*, 1961, 192, 888.

59. Zafar, R. and Jain, A.K. *Indian Drugs*, 1989, 26(10), 573.

60. Williams, R. and Ellis, B.E., (1989). Annu. Meeting, Can. Soc., *Plant Physiol.*, Toronto, (Abstract).

61. Constabel, C.P. and Towers, G.H.N. *J. Plant Physiol.*, 1988, 133, 67.

62. Constabel, C.P. and Towers, G.H.N. *Planta Med.*, 1989, 55, 35.

63. Knopp, B., Strauss, A. and Wehrli, W. *Plant Cell Rep.*, 1988, 7, 590.

64. Christen, P., Roberts, M.F., Phillipson, J.D., and Evans, W.C. *Plant Cell Rep.*, 1989, 8, 75.

65. Brodelins, P.E., Deus, B., Mosbach, K. and Zenk, M.H. *FEBS Letter*, 1979, 103.

66. Brodelins, P.E., Funk, C. and Shillitoo, R.D. *Plant Cell Rep.*, 1988, 7, 186.

67. Yamamoto, H., Suzuki, M., Suga, Y., Fukui, H. and Tabata, M. *Plant Cell Rep.*, 1987, 6, 356.

68. Suzuki, M., Nakagawa, K., Fukui, H. and Tabata, M. *Plant Cell Rep.*, 1988, 7, 26.

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THE MAGIC SQUARE OF TEN AS APPROACH TO ITS IDEAL FORM

S. MAHDIHASSAN

According to ancient beliefs even numbers are potential powers. When properly selected and arranged the group can produce auspicious energy. It can serve the sick or invite blessings to guard against calamities. Such a group of numbers would be called magic square for which the term in Islamic World would be *Taviz* (amulet). On this subject there is enough literature. A classic in English is by Sir W Budge (1961) and in Urdu by Osmani of Deoband. Budge gives more precise information but limits the magic squares to mono-digital numbers which means 3 to 9. It is here proposed to extend the subject by offering magic square of ten.

10	92	93	6	5	4	97	98	99	1
81	19	18	85	86	87	14	13	12	90
71	29	28	75	77	76	24	23	22	80
70	69	68	37	36	35	34	52	53	51
61	45	43	42	44	46	47	58	59	60
40	63	62	57	56	55	54	38	39	41
31	32	33	64	65	66	67	48	49	50
30	72	74	27	26	25	73	78	79	21
11	82	83	16	15	17	88	89	84	20
100	2	3	96	95	94	7	8	9	91

Fig. 1
Magic square of ten.
All series, horizontal or vertical, amount each to 505

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We may distinguish three forms of square of ten:

1. Ordinary square, when 100 is inscribed in 10 rows one below the other.
2. Magic square of ten. The numbers inscribed in 10 rows are such that when counted horizontally or vertically each series gives the same result which in this case is 505.
3. There would be two diagonal series. When these are included the design may be called "Ideal Magic Square of Ten". The present article is a continuation of the one on Magic Square of Nine (1988). As a result the present article permits its design to be compared with the one offered in 1988 on the magic square of nine. To repeat again magic square of ten does not refer to the two diagonals which occur in every square. With this addition, the design would be called "Ideal Magic Square of Ten". We then expect the series of numbers only as horizontally and vertically but not longitudinally.

There is not much to say about its introduction. The previous article of 1988 is the best source. There are others listed in my *Bibliography of Papers* published by Hamdard Foundation Pakistan in 1991. The design itself is self-explanatory.

SUMMARY

Magic squares are called *Taviz* (amulets) in Islamic World. This briefly indicates the importance of the subject. The magic square of ten is higher than that of nine, the highest produced in the past.

REFERENCES

1. Budge, Sir. E. A. Wallis. (1961). *Amulets and Talismans*, New York.
2. Osmani, Hafiz Md. Arshad. *Asli Naqshe Sulemani*, published at Deoband, not dated.
3. Mahdihassan, S. (1988). Comparing the designs of "Nine Square" and the corresponding Magic Square. *Proc. Pakistan Acad. Sci.*, 25(4), pp. 365-370.
4. Mahdihassan, S. (1991). *Bibliography of Papers*, Hamdard Foundation Pakistan.

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FROM JABIR IBN HAYYAN TO RUDOLFIAN ALCHEMISTS

PART I

MERCURY: THEORY AND PRACTICE

VLADIMÍR KARPENKO

Six centuries and several thousand kilometers separated two worlds, which entered the history of alchemy, the first of them as the cradle of successful alchemical theory, the second one as the place and epoch of the last flourish of this science. One of the links between them was just the sulfur-mercury theory born in the Islamic world and transferred through the ages and across continents to Central Europe, where the second half of the 16th century and particularly the reign of the Austrian Emperor Rudolf II (reigned 1576-1611) was in the sign of adepts and masters of the art, as alchemists used to be called. It is interesting to trace sulfur-mercury theory and to compare its formulations in Rudolfian world with Jabir's original idea. For the sake of simplicity this paper will not touch the question of Jabir's identity (discussed by many authors[1, 2, 3]) and sulfur-mercury theory will be considered the work of this alchemist.

In order to follow the path of sulfur-mercury theory it is of advantage to divide this question and discuss at first both components, mercury and sulfur, separately. In alchemical works sulfur and mercury appeared as the real substances, but at the same time as philosophic principles. The present paper will deal with mercury as the first, because this metal stood always in the foreground of laboratory activities as well as theoretical speculations. In the following paper attention will be paid to sulfur, to the transformations of sulfur-mercury theory and eventually to more general questions of alchemical theories. Both papers are an attempt to illustrate which kind of transformations alchemical ideas underwent, but in no case, due to immense number of original sources, this problem can be dealt with in detail. It is the reason why in the period between Jabir's work and Rudolfian Bohemia only the most influential source will be included, the work attributed to Latin Geber.

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Introduction: Mercury before Jabir

History of mercury is described at length by Weeks[4], but nevertheless some details can be added. As one of the proofs of the ancient knowledge of mercury and of its preparation, Sumerian terminology can be quoted. For substance prepared by sublimation the term IM.KAL (in the meaning "soot") was used[5] so that the word for mercury, IM.KAL.GUG, where the last word stood for "red" is in obvious relation to cinnabar, which yields on proper treatment mercury purified further by sublimation.

The linguistic witnesses are rather indirect, but the term ἄργυρον χυτόν (fluid silver) coined by Aristotle in his *Meteorology* (320 B.C.), leaves no doubts that he was familiar with this metal. Aristotle even supposed mercury to contain much water and air, because it resists solidification by cold. For this reason he placed mercury in one group with pitch and olive oil and this judgment decided in many respects about the future theories of mercury.

Clear description of making mercury from cinnabar and the ability of this metal to form amalgams was mentioned by Dioscorides[6] (1st cent. A.D.), but he considered amalgams rather an uncomfortable obstacle which has to be taken in consideration when working with mercury, for he wrote: "It (mercury) can be kept only in vessels of glass, lead, tin (?), or silver, for if put in vessels of any other substances it consumes them and flows through". Apart from the not fully correct statement as to the resistivity of named metals, Dioscorides was obviously not familiar with the practical use of amalgams at the time when Egyptian craftsmen worked not only with gold amalgam, but with tin amalgam as well (Recipe 5 of Papyrus Leyden X, Ref. 7). The term "amalgam" was applied much later[8] by Thomas Aquinas (1225-1274).

Not less important than mercury itself, is for the present discussion its compound with sulfur. Cinnabar was known already in antiquity and found use as a red pigment although it never reached the importance of ochres based on iron oxides. The oldest wall paintings where cinnabar was used are of the Greek origin[9] dated approx. to the 4th cent. B.C.

The isolation of mercury from cinnabar[10] indicated certain connection between mercury and sulfur, but it took seven centuries after Dioscorides before the opposite reaction, the synthesis of cinnabar, was carried out. Gettens *et al.*[11] supposed it to be done in China, but it is more reasonable to assume that it was rather independent discovery of Chinese and Arabic alchemists.

As to what concerns the ideas of Chinese alchemists interesting information can be found in Pao-p'u tzu of Ko Hung (4th cent. A.D.)[12]: "Knowing little, ordinary people marvel much. Some of them do not know that mercury is a derivative of cinnabar. When we tell them about it, they will not believe it. They reply that since cinnabar is

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basically a red substance, how could it ever become a white substance like mercury! They also say that cinnabar is only stone and since the roasting of stones produces at best ash or lime, why should cinnabar be the only one to act as we claim it does?"

Confusion in this question is clearly illustrated in the same source, when after this quite sound statement nine further cinnabars are described in the same chapter (fourth), composition of which had nothing in common with HgS. The problem of cinnabar, although standing seemingly in the background, turns out to be one of the crucial questions alchemists had to solve in order to be able to apply successfully sulfur-mercury theory.

Islamic Alchemy

The ideas attributed to Jabirian school are widely known so that it is not necessary to go into details. Stress will be laid on certain points only which appeared later in European alchemy. It was sometimes, particularly by European authors, forgotten that in what concerned the constitution of matter, Jabir followed the Aristotelian idea of four elements, but as the first level he postulated the existence of four elementary qualities: hotness, coldness, dryness and moistness. Their union with substance led to the compounds of the first degree, which in their turn formed pairwise corresponding elements: fire (hot + dry + substance), air (hot + moist + substance), water (cold + moist + substance) and earth (cold +dry + substance). In metals two elementary qualities were supposed to be internal and two external ones (for details of this theory see Holmyard[13]), like for example[14]

lead	external:	3 parts of coldness
		8 parts of dryness
	internal:	1 part of hotness
		5 parts of moistness
gold	external:	3 parts of hotness
		8 parts of moistness
	internal:	1 part of coldness
		5 parts of dryness

Compared thus with other metals, mercury was according to Jabir's *Al-kutub as-sab'un*[15] identical with lead in its outer qualities (both coldness and moistness) and with tin in inner qualities (hotness and dryness).

The second aspect of Jabir's views is his sulfur-mercury theory. The details are discussed elsewhere (see for example Holmyard[13]). It should be however noted here that it was just this theory which led to the separation of the ordinary mercury and sulfur from their

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philosophic counterparts defined as the basic constituents of matter. On one side a quite reasonable recipe for cinnabar is given in Jabir's *Kitab al-hawass al-kabir*[16] using direct synthesis from mercury and sulfur, on the other side these substances as generalized principle constituents of matter appear in *Kitab al-idah*[17]. Detailed discussion of their role in the formation of metals is in Ibn Sina's *Kitab al-Shifa*[18].

The idea that metals are formed in reaction of philosophic mercury with philosophic sulfur was partly based on observation of real substances, on the melting of metals, evolution of various kinds of vapors on heating etc. Important is that Jabir's theories gave a strong stimulus to alchemy at the time when this science could hardly have survived with Aristotelian elements only. This product of Islamic alchemy was then transformed to Latin Europe where alchemy experienced her last flourish and the ultimate fall. Famous focus of this flourish was Central Europe, particularly Prague before and during the reign of Rudolf II.

Latin Europe

The development of alchemy in Europe was too long to be even summarized here briefly. For the present discussion aimed toward Renaissance Central Europe, it is of advantage to choose one source which exerted profound influence on European alchemy and was a late medieval product. As such intermediate work *Summa perfectionis magisterii* appears to be the most suitable one. This work is supposed to be written in the 13th century, when it was attributed to Jabir, his name being latinized to Geber. This book was the most influential work on alchemy in the late Middle Ages and recently the identity of its author, Pseudogeber or Latin Geber, was established with high reliability. The author was apparently Paul of Taranto, a practically unknown member of the Franciscan order[19]. For the present discussion Nürnberger edition of the *Summa*[20] from 1541 will be used.

In the *Summa* all metals known at that time were described at length and the author showed broad practical knowledge. As regards the origin of metals, the answer is in Book I Chapter 30 entitled "About Mercury". Among others the author stated that "in the opinion of many scientists it is [mercury] together with sulfur the matter of all metals". It is quite clear evidence that he accepted the sulfur-mercury theory and the origin of gold as described in Book II, Chapter 61. "About the Nature of Gold" is almost identical with the similar description by Ibn Sina[18]. The *Summa* writes that "gold originated from the most subtle matter of mercury and pure, red, fixed and in its nature not transformed matter of sulfur, which gives it the color of gold". The same is repeated once more in this chapter, but now the additional sentence follows: "But mercury is contained more in it [gold] than sulfur, therefore mercury has stronger influence on gold".

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This sentence, which is a reflection of amalgamation of gold, turns the attention to mercury as the more important of both partners gold was allegedly formed of. The question is what was the *Summa's* author's opinion about mercury itself. The answer could be sought in the same book Chapter 59 "About the Nature of Mercury". It is obvious that mercury remained a mystery to alchemists, because nothing is said about its composition or about its origin. At the same time the *Summa* does not operate with outer and inner qualities of metals, but in the particular case of mercury as the crucial form of this metal so called "middle substance" is mentioned. In order to get the preparation suitable to "projection" (transmutation) just this substance had to be isolated. For this purpose both "earthy" and "watery" component had to be removed, the former by sublimation, the latter by washing. According to the *Summa* the "earthy" substance contaminating mercury was unclean, combustible, while the "watery" substance was volatile.

We can briefly summarize the views of the *Summa.* Sulfur-mercury theory was repeated here in its simplest shape stating that metals are formed from both above mentioned substances. Slightly more importance was given to mercury. The use of the terms "earthy" and "watery" is obviously reflection of Aristotelian theory, but there is no apparent link to inner and outer qualities of metals coined by Jabir. It seems thus that only the simplest sulfur-mercury theory survived the transformation from Islamic alchemy to the Latin world. Delicate nuances of inner and outer qualities not speaking about Jabir's numerology were obviously too complicated to be transformable without significant corruption.

The sulfur-mercury theory in the simplest version could survive more easily because of its seemingly clear formulations. It should be noted however that it was quite understandable only at the first sight, while at closer look mysterious philosophic mercury and sulfur came forward. This complication could have been one of reasons why later alchemists did not pay too much attention to cinnabar which cast doubts on the very fundaments of the sulfur-mercury theory. As pure as both substances ever were their reaction led inadvertently to cinnabar, but never to any metal. Simultaneously, any preparation which was called a "philosophic" one, did not resemble either mercury or sulfur.

Rudolfian World

Before discussing alchemical theories of this cultural epoch it would be useful to define more precisely what will be understood by a "Rudolfian world" and which sources will be used. The Austrian Emperor and Bohemian King Rudolf II (1552-1612) ascended the throne in 1576 and from 1583 he resided in Prague making this town the center of cultural and particularly alchemical world (for details

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see Evans[21]). The mighty flourish of alchemy during Rudolf's reign was an era of culmination, the foundations of which were laid earlier. The whole 16th century in Bohemia was marked by flourishing culture and science, including alchemy. When discussing Rudolfian world the picture would not be complete without this prelude.

As regards sources used in the present paper only two were chosen. The first one is an anonymous manuscript[22] dated 1576 kept under the signature III H 11 in the National Museum (Prague). Throughout this and the following paper it will be referred to under this signature. The second source is one of the works of the most important Czech alchemist Bavor mladsi (younger) Rodovsky from Hustirany (?1526-?1600) a nobleman who devoted most of his life to alchemical studies. His main works in this field, all written in the Czech language, are: an unnámed manuscript containing four translations of foreign works (1576), "The Book about the Perfect Art of Chemistry" (1585, this manuscript, now in Leyden, The Netherlands, will be referred to as BCh), Philosophical Talks (1591), The Czech Alchemy (undated). The works cited form a firm basis on which a picture of the Renaissance alchemy in Central Europe can be drawn. While the MS III H 11 documents the state of alchemy before Rudolf's reign, Rodovsky was active during this period.

We can try now to answer the same two questions like in the preceding section: (a) the theories of the composition of matter, (b) what was mercury supposed to be.

As regards the theories of matter both original ones, Aristotelian and sulfur-mercury, survived, but the later Paracelsian theory of tria prima did not take roots in Rudolfian time to a significant extent. This was due to the fact that Paracelsus' works were translated into Czech by Bavor Rodovsky so that the majority of Czech speaking alchemists of Rudolfian period could not get acquainted with the new theory.

Aristotelian theory continued to be used, but appeared sometimes in a rather corrupted form, or was even denied. The MS III H 11 brings a typical example (p. 244):" ... since many believe, ..., and sum up their art being in four elements, or souls, that is to say in Sulfur, in Arsenic, in Mercurius itself and in Sal ammoniac, and in this way they are in a great blunder."

This passage illustrates the attitude toward Aristotelian elements in the late European alchemy. Some of alchemists believed in their existence, others did not claim directly that these elements do not exist, but did not think them to be the basis of the Art. Further comment is necessary concerning the four elements themselves. It is apparent at the first sight that instead of fire, water, earth and air they took the shape of definite substances. This was a gradual process the first traces of which can be observed in Bohemia in the 15th century. In the oldest Czech alchemical manuscript, the element air is identified with sal ammoniac (for details see Karpenko[23]).

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The text of the MS III H 11 reads further: "... and leaving all these blunders, and erroneous things, ... we will rather understand that no seed can bring any use unless it is thrown in earth, and mortified. In a similar way it is in our Art, since our seed is the living silver, ...". It is again mercury which is considered to be a seed of metals and in this passage no word is said about sulfur. In this case it is rather a recipe, not much theoretical speculations are formulated here. Anyway, growing importance of mercury is apparent from a long theoretical explanation given in BCh. In a very complicated form the author stated that mercury is the true origin of all metals and that this mercury is formed in the bowels of earth from four elements. In the following text however, sulfur as the second principle is introduced, being called a father of metals, while mercury was their mother.

Sulfur-mercury theory continued to be influential in alchemical theories, but now in its simplest form, with stress laid on mercury. The inner and outer qualities as defined once by Jabir disappeared almost completely from speculations of Rudolfian alchemists. Only from time to time similar kind of characterization can be found, but it is rather a reflection of Aristotelian view, like the characterization of mercury as moist and cold.

The question — what is mercury? — was for Rodovsky difficult to answer as it was for his predecessors, but, nevertheless, in BCh (p. 76b) where fundamental principles of sulfur-mercury are explained, certain attempt was undertaken. This explanation is very nebulous — according to it if the evaporations from the earth's bowels escape before being hardened by sulfur, keep either much or little of hotness, and just these evaporations "remain to be mercury and not a metal". This sentence is interesting, because it documents that even as late as in the 16th century, mercury was not considered to be a metal.

The reader of BCh was further warned (p. 79b) that although the origin of metals is in mercury, the ordinary metallic mercury must not be confused with that origin. This origin, here not called philosophic mercury as was usual, is once more described as being formed out of four elements. One sentence in this very corrupted text could have been considered a distant echo of "inner" and "outer" qualities: "And that he [mercurius] is cold and moist inside, and is therefore called a water, or mercurius ...". In Jabir's view however, the coldness and moistness should be the outer qualities.

PART II

SULFUR: THE ORIGIN OF METALS

The second partner in the sulfur-mercury theory, traditionally written as the first one, has been known from very distant past mainly

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due to its inflammability. This property of sulfur was used in the preparation of different kinds of incendiary mixtures. The earliest of them were described by Livy[1] as torches of Bacchantes, which caught fire upon dipping into water. Later on similar basis more sophisticated mixtures were developed for use in warfare as famous Greek fires[2]. All this evidence shows that in ancient times sulfur was a substance of practical use and was not to a significant extent included in theoretical speculations. Pliny distinguished between four kinds of sulfur[3]: (1) sulfur vivum, or apyron — introduced by fire — occurred in solid masses or blocks and was used for medical purposes, (2) gleba, or glebaceous sulfur, used in the workshops of fullers, (3) egula, which was used for fumigating wool and (4) sulfur, which was used in the preparation of matches.

Chemical reactivity of sulfur, particularly the synthesis of cinnabar, was discussed in Part I of this paper. Besides combustibility it was volatility of sulfur, which predetermined this substance to become attractive for alchemical theories.

Islamic Alchemy

The basic idea of sulfur-mercury theory as well as the question of the "inner" and "outer" qualities of metals was already discussed. From the point of view of present discussion concerning the position of sulfur in alchemical theories attention should be paid to Ar-Razi's *Kitab al-asrar*. There are in this book two facts which were of utmost importance to the further evolution of chemical and alchemical thinking. In the first plane it was Ar-Razi's system of substances known at that time. In this system, included in the group of volatile substances ("spirits"), are mercury, sal ammoniac, "arsenic" and sulfur. Individual substances are then discussed in detail. There are several kinds of sulfur listed with the commentary that sulfurs of other colours, red, respectively white, are not suitable for the work[4]. The second point is the question of two volatile substances — "arsenic" and sulfur. By the term "arsenic" several compounds are meant, colours of which varied, but there were red and yellow among them as well. This could have led to confusion of some of "arsenics" with sulfur.

Ar-Razi's contribution turns out to be of crucial importance, but his classification of substances called for a precise distinguishing, particularly of some of the "spirits" and of salts. This condition could not always be met in sometimes primitive conditions of alchemical laboratories. Errors of this kind resulted inadvertently in incorrect interpretation of experiments and could then be registered in written form.

Latin Europe

Like in the case of mercury, Pseudogeber's *Summa perfectionis*

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magisterii will be used as a representative of the late medieval works. This is for discussion of sulfur maybe even more important than it was with mercury, since this work stands in close link to Islamic alchemy and as pointed out by Newman[5] the text is in some parts derived, through several intermediate works, just from *Kitab al-Asrar*. The more interesting are then Chapters 28, 29 and 30 of the first book of the *Summa*, which are devoted to sulfur, arsenic and mercury respectively. Following chapter (31) is entitled "About bodies which are composed of named basic substances", where bodies are metals. The inclusion of arsenic as the third principle is quite rare in medieval European alchemy and according to Newman[6] it cannot be traced out in the main Arabo-Latin texts. Pseudogeber was not consistent in his views so that later in the *Summa* he fully accepted sulfur-mercury theory as the explanation of the origin of metals. The appearance of arsenic as one of basic principles could have been just a result of its classification among Ar-Razi's "spirits". Today it is difficult to trace the way alchemists used to follow in their speculations, but apparent similarity between some compounds of arsenic and sulfur together with the common classification of both basic substances as "spirits" could have led to conclusion that more "spirits" take part in the formation of metals. It is from this point of view interesting to note that sal ammoniac is missing in Pseudogeber's speculations.

As regards sulfur itself the *Summa* yields both the theoretical explanation of its origin and practical observations from the laboratory (Book I, Chap. 28): "Sulfur is a fatty earth thickened in the mine by boiling until it has hardened and become dry; and when it has hardened it is called sulfur. It has a very strong composition and is of uniform substance in all its parts because it is homogeneous; and therefore its oil is not removed by distilling as with other substances possessing oil ... Sulfur can be calcined only with great loss. It is as volatile as a spirit. When calcined with sulfur all metals increase in weight, in a manner which cannot be questioned, for all the metals can be combined with sulfur, excepting gold, which combines only with difficulty. Mercury combines with sulfur producing a sublimate of uzufur or cinnabar. Sulfur usually blackens the metals, but it does not transmute mercury or silver as some philosophers imagine."

The answer why arsenic was included among the constituents of matter together with sulfur can be found in the Book I, Chap. 29: "It [arsenic] is composed of a subtle matter and is in its nature related to sulfur, and thus one cannot define it but like sulfur". The following sentence gives the explanation why in spite of being seemingly identical, sulfur and arsenic were nevertheless taken as two different substances:" It [arsenic] differs however from sulfur, because it [arsenic] is the tincture for White, sulfur for Red". Regarding sulfur as the tincture for red (golden) colour, this question is not clear, but the use of arsenic compounds for whitening of copper was common technique of ancient origin. An example of it can be found in the recipe 23 of the

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Papyrus Leyden X[7] and just this apparent transmutational effect of arsenic was obviously the reason, why these substances were included among the basic constituents of matter (plural expression — substances — is necessary here, since at least two compounds of arsenic were given the term "arsenic": they were orpiment As_2S_3 and sandarac As_4S_4).

Once more is the idea of sulfur and arsenic as basic constituents of matter repeated in the Book II, Chap. 58 "About the Nature of Sulfur and Arsenic", where both substances denoted as spirits are said to be basic principia of metals. They are, according to this explanation, contaminated by combustible substance and by earthy impurity, both of which have to be removed prior to the use of sulfur and arsenic in the Art. On proper treatment not given here the middle part should be prepared (defined as a part existing between the Combustible and the Earthy) and solely this preparation after being fixed should be reacted with mercury and was said to be able to make metals more precious.

In the following chapters, however, all of the then known metals are described as being composed of mercury and sulfur. Arsenic is not mentioned here.

Rudolfian World

Sulfur itself almost does not appear in sources cited in the Part I of this paper, although the Czech manuscript III H 11 contains a short passage (p. 315) entitled *De Sulphure* (only the title is Latin, the text is Czech). On closer examination it is a recipe how impurities are to be removed. It should be added that this recipe is not fully reasonable. The rest of this article *De Sulphure* does not deal with sulfur at all.

But, nevertheless, the MS III H 11 is an important source of information. As mentioned in Part I of this paper, on p. 242 of this manuscript the question of the composition of matter has been dealt with. The anonymous author denied claims of others who supposed sulfur, arsenic, mercury and sal ammoniac to be such a basis. In the light of the preceding discussion just this part is of extraordinary importance, since these four basic principles are identical with Ar-Razi's four "spirits" and three of them, sulfur, arsenic and mercury are trio, which is according to Newman rare in medieval alchemical texts. Here all four substances are named, which supports the evidence that there was link between such distant periods as was the late renaissance alchemy in Europe and Islamic apogee of this science. Ar-Razi's idea, although the author was not cited, remained vivid. It would be too difficult a task to trace out this connection, but the Czech manuscript is one of evidences.

The Book about the perfect art of chemistry (BCh) by Bavor Rodovsky (written 1585) is in the sign of sulfur-mercury theory, which

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is here given in not quite understandable form. Sulfur does not appear here isolated, its role is discussed together with mercury. There is, among others, an attempt to explain how philosophic mercury and sulfur originate in the earth's bowel (p. 82): "There are also in the earth ye given spirits and fumes, which only now were found from ye qualities of four elements, they are closed by ye moistness of earth, and through nature and pouring (?) of the sun and other planets and through the influence of them they were baked together, and, united with watery vaporous nature and with pure and subtle earthy nature, they then form philosophic mercury, which, being dried slightly and transformed into fiery earthy subtle hardness, could become philosophic sulfur".

It is not only the witness that sulfur-mercury theory dominated in the late Renaissance, but just this text is a typical example of the language of alchemy of that time. Nebulous expressions made it practically impossible to interpret any sentence which thus acquired broad meaning. There was no clear cut boundary between ordinary and philosophic forms of substances which allowed fraudulent alchemists to simulate successfully their search for these mysterious principles.

At this point two conclusions can be drawn:

(1) Sulfur-mercury theory survived, but as was shown in a few examples it was only the basic idea that metals are formed out of these two principles. More precise description of kinds of sulfur and mercury necessary to form individual metals, as given by Ibn Sina[8] became gradually more and more nebulous. By the end of the 16th century only traces of original idea can be detected, when sometimes the authors described sulfur of gold as the purest and yellowest, while sulfurs of remaining metals were said to be impure.

(2) At the same time four Aristotelian elements remained as the other theoretical foundation, sometimes they were claimed to be the basis mercury should have originated from. In some cases instead of four Aristotelian elements four Razi's "spirits" were considered to be this origin. It is interesting to note that the fourth spirit can be found in the manuscript from the 16th century, while older Pseudogeber's *Summa perfectionis magisterii* knows only three of them: mercury, sulfur and arsenic. Not less interesting is that arsenic, although mentioned in this connection, does not appear much in recipes.

The Origin of Metals

This problem can be approached from more standpoints. Preceding discussion was focused on theories of what matter was

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supposed to be composed of, but more questions can be asked. One of them will be the theme of the final part of this paper. In many alchemical works the origin of metals was described. For the present discussion it is not decisive which theory was accepted by an author, because the question points to another problem: very often metals were arranged in a set according to their origin. Was this arrangement random, or was there certain deeper meaning behind it?

At the first sight the answer seems to be easy. Not only descriptions of the origin of metals, but also the instructions for alleged transmutation proceeded from common metals to more precious ones and the final stage was always gold, preceded by silver. Both metals were the ultimate goals alchemists attempted to reach so that they should be expected to be final members of any set. There are, however, still five metals left, sequence of which could have been a random one, but with equal probability could have resulted from either certain theoretical speculation or practical observation. It seems to be that both these possibilities can be found in alchemical literature. In order to document it the present discussion will not be limited to literary sources used in the preceding parts of this paper.

The first possibility, theoretical speculations, are obviously the basis for the origin of metals as described in the Chinese Huai-nan-dz[9] (approx. the 2nd cent. B.C.). The idea of this theory is obvious from the explanation how gold is formed: "When effluvia from the main lands ascend to the dusty heavens, the dusty heavens in five hundred years give birth to jüe, jüe in five hundred years gives birth to yellow quicksilver, yellow quicksilver in five hundred years gives birth to yellow metal [gold] ...".

In a similar way the origin of the following four metals is given, the common point of this theory being connection of the metals with effluvia from certain lands and with definite time intervals. Total number of metals, five, can easily be explained by the importance of this number in Chinese philosophy[10], time intervals are apparently not random as well. Geographic directions, also five in number, were connected with five Chinese elements, earth, water, fire, metal and wood, and these elements in their turn found the expression in the numbers of the Lo Shu magic square[11]. The time interval given for any of five metals corresponds always with one of the numbers of this square attributed to respective basic element and geographic direction. This number is multiplied by 100 (for details see Karpenko[12]). Based on time intervals this Chinese source leads to the sequence: Au (500 years), Fe (600), Cu (700), Pb (800), Ag (900). As illustrated by this analysis the Chinese approach, at least in Huai-nan-dz, is an example of a speculative way to the answer about the origin of metals. In this particular case it arises from numerical mysticism.

Islamic and European alchemy, especially the second of them, were based to a considerable extent on experiment (except for purely mystical schools). This fact can be expected to exert an influence on

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conclusions about the origin of metals (as mentioned above the same is true for ideas concerning transmutation so that under "origin of metals" their transmutation will be understood as well).

In Islamic alchemy detailed description of the origin of metals can be found in *Kitab al-Shifa,* by Ibn Sina[13]. Depending on the purity of both constituents, sulfur and mercury, different metals should be formed. This text can be summarized in tabular form (Tab. I). Gold and silver are, as expected, at the top of this sequence being the most precious metals from this set, but the question is left open whether remaining metals are arranged randomly or not. Placing of lead on the lowest position, opposite to gold, is obviously a reflection of the ancient belief that just lead was the "father" of all metals.

TABLE I

THE SUPPOSED SEQUENCES OF THE ORIGIN OF METALS AS COMPARED WITH AGRIPPA'S MAGIC SQUARES AND WITH REDOX POTENTIALS

→ more precious

Ibn Sina[9]	Pb	Sn	Fe	Cu	Ag	Au	
Sendivogius[14]	Pb	Sn	Fe	Au	Cu	Hg	Ag
Rodovsky[16]	Fe	Pb	Sn	Cu	Ag	Au	
Agrippa[17]	Saturn Pb	Jupiter Sn	Mars Fe	Sun Au	Venus Cu	Mercury Hg	Moon Ag
redox potentials (V)	Sn^{2+}/Sn −0,141 Sn^{4+}/Sn +0, 050	Pb^{2+}/Pb −0,126	Fe^{2+}/Fe −0, 44 Fe^{3+}/Fe −0, 036	Cu^{2+}/Cu +0,34 Cu^{+}/Cu +0, 52	$Ag^{+}Ag$ +0,799	Hg^{2+}/Hg +0, 854 Hg_2^{2+}/Hg +0,798	Au^{3+}/Au +1, 42 Au^{+}/Au +1, 7

For further comparison the work from another historical epoch will be chosen. A Polish nobleman and alchemist Michael Sendivogius (1566-1636) active among others in Rudolfian Bohemia as well, published here in 1604 his famous book *Novum lumen chymicum.* In this work he investigated interrelations between metals comparing them with planets. His reasoning is of particular interest as pointed out recently[14]. Sendivogius wrote that planets are arranged in a certain system the result of which is that for example Venus cannot become Mars, but Mars moving in a higher orbit could become Venus. Similarly Jupiter can substitute Mercury in his orbit and this heavenly process

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is reflected on the earth by processes when copper (Venus) is eliminated from its salt by iron (Mars), or mercury (Mercury) by tin (Jupiter). A comparison of this idea with redox potentials leads to fairly good agreement, which, nevertheless does not mean that Sendivogius was familiar with electrochemistry. His commentary resulted from careful observations of substitute reactions between metals and various salts. His sequence of metals can be included into the Table I. Rather surprising is the central position of gold (Sun) which was commented by Sendivogius that "there is a big similarity of Saturn and Moon, Sun being situated halfway between them". The same position of the Sun is then repeated for pairs Jupiter-Mercury and Mars-Venus. There is, however, another explanation possible, which will be discussed later.

Novum lumen chymicum assumes extraordinary position in alchemical literature, because the sequence of metals was explicitly (although with usual traditional mysticism) connected with chemical reactions of metals. From this point of view it can be considered the height of alchemical theories, the height where they came as close to chemical thinking as they were able to come. Earlier works, although arrived at more or less similar results, explained them in the framework of the then prevailing theories.

This was the case of the book of the perfect art of chemistry by Rodovsky[15]. In the explanation of the origin of metals as the first matter philosophic mercury is considered which upon reacting with philosophic sulfur forms metals in the sequence: Fe, Pb, Sn, Cu, Ag, Au (Tab. I).

All three sequences can be compared with redox potentials of individual metals (Tab. I). This comparison is interesting from several points of view. Based on chemical practice (Sendivogius) or explained by sulfur-mercury theory, iron was always correctly placed before copper. The arrangement of Cu, Ag, Au respectively Hg by Sendivogius was correct in Ibn Sina's and Rodovsky's works, both of which represent here the classical approach of sulfur-mercury theory. The first three metals, Pb, Sn, Fe, were arranged by Rodovsky in the order exactly opposite to their electrochemical properties, while the two other sources have the same error in positions of Pb and Sn. The word "error" is not just the most suitable one, because similarity of both metals could have confused alchemists very easily. Anyway, alchemists in spite of the fact that they were far from chemical minded in the modern meaning of this expression did not choose a random sequence of metals. At least to some extent practical observations can be traced out. As regards the rather unusual position of gold in the sequence given by Sendivogius, it is interesting that this sequence is identical with that given by Agrippa[16] (1531) for planets and their magic squares[17]. It could be a sign of still very strong influence of astrology, which could have contributed to the solution of the problem with the placing of tin and iron.

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REFERENCES

PART I

1. Leicester, H.M. *The Historical Background of Chemistry,* Dover Publ., New York, 1956, p. 63 ff.
2. Holmyard, E.J. *Alchemy,* Penguin Books, Harmondsworth, 1957, p. 66 ff.
3. Fück, J.W. The Arabic Literature on Alchemy According to An-Nadim, (A.D. 987), *Ambix IV,* 81, (1951).
4. Weeks, M.E. Discovery of the Elements, *J. Chem. Educ.,* 7th Ed., 1968, p. 46.
5. Levey, M. *Chemistry and Chemical Technology in Ancient Mesopotamia,* Elsevier Publ., Amsterdam, 1959, p. 36.
6. Agricola, G. *De Re Metallica,* Dover Publ., New York, 1950, note on p. 432.
7. The Leyden Papyrus X. *J. Chem. Educ.,* 3,1149 (1926).
8. Mellor, J.W. *A. Comprehensive Treatise on Inorganic and Theoretical Chemistry,* Longmans, London, 1928, Vol. IV, p. 695 ff.
9. Noll, W. Anorganische Pigmente in Vorgeschichte und Antike, *Fortschr. Miner.,* 57, 203, (1979).
10. *Op. cit.,* ref. 4, p. 47.
11. Gettens, R.J., Feller, R.L. and Chase ,W.T. *Stud. in Conservation,* 17, 45, (1972).
12. *Alchemy, Medicine, Religion in China of A.D. 320: The Nei P'ien of Ko Hung* (Pao-p'u tzu), The M.I.T. Press, 1966, p. 72.
13. *Op. cit.,* ref. 2, p. 72 ff.
14. Garbers, K. and Weyer J. Quellengeschichtliches Lesebuch zur Chemie und Alchemie der Araber im Mittelalter, H. Buske Verl., Hamburg, 1980, p. 86.
15. *Op. cit.,* ref. 14, p. 26.
16. *Op. cit.,* ref. 14, p. 14.
17. *Op. cit.,* ref. 14, p. 34.
18. *Op. cit.,* ref. 14, p. 36.
19. Newman, W. New Light on the Identity of "Geber", Sudhoffs Archiv, Band 69, Heft 1, p. 76 (1985).
20. *Die Alchemie des Geber,*transl. by E. Darmstaedter, J. Springer Verl., Berlin, 1922.
21. Evans R.J.W., *Rudolf II and His World,* Clarendon Press, Oxford, 1973.
22. It is a collection of several older manuscripts; for details see Karpenko, V., *Greek Fire in a Czech Alchemical Manuscript,* Centaurus 30, 240, (1987).
23. Karpenko, V. The Oldest Alchemical Manuscript in the Czech Language, *Ambix,* 37, 61, (1990).

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PART II

1. Livius, T. Lib. 39, Cap. 13.
2. Stillman, J.M. *The Story of Alchemy and Early Chemistry,* Dover Publ., New York, 1960, p. 195 ff.
3. Mellor, J.W. *A Comprehensive Treatise on Inorganic and Theoretical Chemistry,* Longmans, London, 1930, Vol. X, p. 1.
4. Garbers, K. and Weyer, J. Quellengeschichtliches Lesebuch zur Chemie und Alchemie der Araber im Mittelalter, H. Buske Verl., Hamburg, 1980, p. 8.
5. Newman, W. The Genesis of the Summa Perfectionis, *Archives Internationales d'Histoire des Sciences,* 35, 240, (1985).
6. Newman, W. New Light on the Identity of "Geber", *Sudhoffs Archiv,* 69, 76, (1985).
7. The Leyden Papyrus X, *J. Chem. Educ.*, 3,1149, (1926); similar procedures were known in medieval Europe, cf. recipe 72 in Mappae clavicula, (Trans. Amer. Philos. Soc, 64, Part 4, 1974, p. 38).
8. *Op. cit.,* ref. 5, p. 36.
9. Dubs, H.H. The Beginning of Alchemy, *ISIS XXXVIII,* 62, (1947).
10. Lu-Ch'iang, Wu and Davis, T.L. An Ancient Chinese Treatise on Alchemy, entitled Ts'an T'ung Ch'i,. *ISIS XVIII,* 209, (1937) (see Introduction, p. 216 ff.).
11. Mahdihassan, S. The Magic Square of Three Compared with the Chinese Symbol of Cosmogony, Yin-Yang, Pa-Kua, Part II, *Hamdard Medicus,* XXXIII, No. 4, 90, (1990); Karpenko V., Magic Squares in European Mysticism, *Hamdard Medicus,* XXXIV, No. 2, 39, (1991).
12. Karpenko, V. Magic Squares in the History of Science; What Confucius was Waiting for? *Ambix,* submitted.
13. Michal, Sedziwój. Traktat o kamieniu filozoficznym/Polish/, Panstwove Wydawnictvo Naukove, Warszawa, 1971, p. 85 ff.
14. *Op. cit.,* ref. 14, p. 120.
15. This passage is in Rodovsky's book on p. 76b.
16. Agrippa ab Nettesheym Henrici Cornelii, Occulta philosophia, included as a part of his Opera, (Lugduni), 1531.
17. *Op. cit.,* ref. 12, Karpenko V.

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THE MAGIC SQUARE OF TWELVE

S. MAHDIHASSAN

Several articles have been published which are listed in the Bibliography of Papers published in 1991, and the highest number of which a magic square has been discussed is 9. Sir W. Budge (1961) in his classical work *Amulets and Talismans* gives magic squares as belonging to such a category and the highest number of which a magic square is given is again 9. Magic squares belong to the science of Numerology. In Babylon it was believed that even numbers are potential powers. Then two numbers as opposites can produce auspicious energy which can be beneficial as required. Jabir ibn Hayyan mentions more than once that the magic square of three can facilitate child birth. Even Thite (1982) confirms stating that when a pregnant woman looks at that design she experiences easy delivery. Since magic squares can prove to be useful, attempts have been made to produce them. It appears that the more the numbers, the greater is the chance of their producing auspicious energy. With this view I have tried to produce the magic square of ten. I must confess that I found the task very difficult and I was happy that after all I did succeed. I have now tried to produce the magic square of twelve. The method of producing a magic square differs from case to case and has been explained in the article of 1988 on the magic square of 9.

The method used in the present case would be as follows:

1. Produce an ordinary magic square of 12.
2. On a separate paper place at the four corners numbers 1, 12, 144 and 133 as seen in Fig. 1 here.
3. Then produce the series as right diagonal and left diagonal, also shown in Fig. 1.
4. The right diagonal begins with the number 1, and the numbers increase by the addition of 13, which means 12 plus 1.
5. The left diagonal begins with 12 and increases by the addition of 11 which means 12 minus 1.

Thus there is no difficulty in producing the series of two diagonals. Fig. 1 easily shows this. How the majority of numbers have been

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12	134	136	135	8	7	6	5	141	142	143	1
121	23	22	21	125	126	127	128	16	15	14	132
36	35	34	112	113	114	115	116	117	27	26	25
97	98	99	45	44	43	42	41	40	106	107	108
85	86	87	57	56	55	54	53	52	94	95	96
84	81	83	82	80	67	66	65	64	63	74	61
71	72	70	69	68	79	78	77	76	75	62	73
50	51	49	88	92	91	90	89	93	58	59	60
37	38	39	105	101	102	103	104	100	46	47	48
120	119	118	28	29	30	31	32	33	111	110	109
13	131	130	124	17	18	19	20	129	123	122	24
144	2	3	4	137	138	139	140	9	10	11	133

Fig. 1
Magic Square of Twelve. The Right and Left Diagonal Series show numbers connected with one another.

transferred from an ordinary square of 12 to its magic square becomes evident on comparing them and consulting the article of 1988.

A magic square contains all horizontal and vertical series numbers which give the same amount as do the two diagonal series. In the present case they give 870. This is because each series contains 6 pairs of numbers and each pair amount to 145. We find 144 + 1 = 145, also 12 + 133 = 145. Then towards the middle 5 + 140 = 145. Since there are 6 pairs in each series 145 x 6 = 870. It would be critically observed that opposites are placed diagonally. Thus 13 is on the left at the bottom, and 132 its opposite is on the right at the top. But when counted 13 becomes a number both of the vertical series and of the horizontal one. The same is the case with its opposite number 132. At any rate it is decided that in a magic square each number belongs to both series, vertical and horizontal. As result in Fig. 1 all vertical and horizontal series amount to 870, like the two diagonal series.

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SUMMARY

A magic square can be formed by transferring the numbers from its ordinary square so that all series vertical and horizontal as also the two diagonal series give the same amount. In the case of magic square of 12, these series amount to 870. Fig. 1 illustrates it.

REFERENCES

1. Budge, Sir E.A. Wallis. (1961), *Amulets and Talismans,* N.Y.
2. Thite, G.U. (1982), *Medicine, its Magico-religious aspects* according to Vedic and later Literature, Poona.
3. Mahdihassan, S. (1988). Comparing the designs of nine-square and the corresponding magic-square. *Proc. Pak. Acad, Sci.,* 25(4): pp. 365-370.
4. Mahdihassan, S. (1991). *Bibliography of Papers,* Pub. Hamdard Foundation Pakistan.

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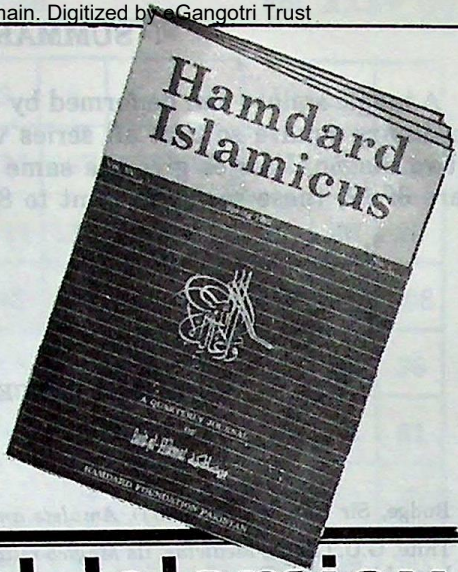

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ASSAY OF DIPHENHYDRAMINE HYDROCHLORIDE

SYED SAEED-UL-HASSAN AND M. ASHRAF

Introduction

Diphenhydramine hydrochloride (Fig. 1) is an antihistaminic drug which is available in the form of syrups, capsules and lotions.[1, 2] It is a potent antihistaminic agent which shows anticholinergic, antitussive, anti-emetic and sedative effects[3].

Several techniques have been used for the quantitative determination of diphenhydramine hydrochloride which include acid base titration,[4-6] non-aqueous titration[1, 5], spectrophotometric[7-9], colorimetric[10-11], polarographic[12], potentiometric[13-14] and chromatographic techniques[15-19].

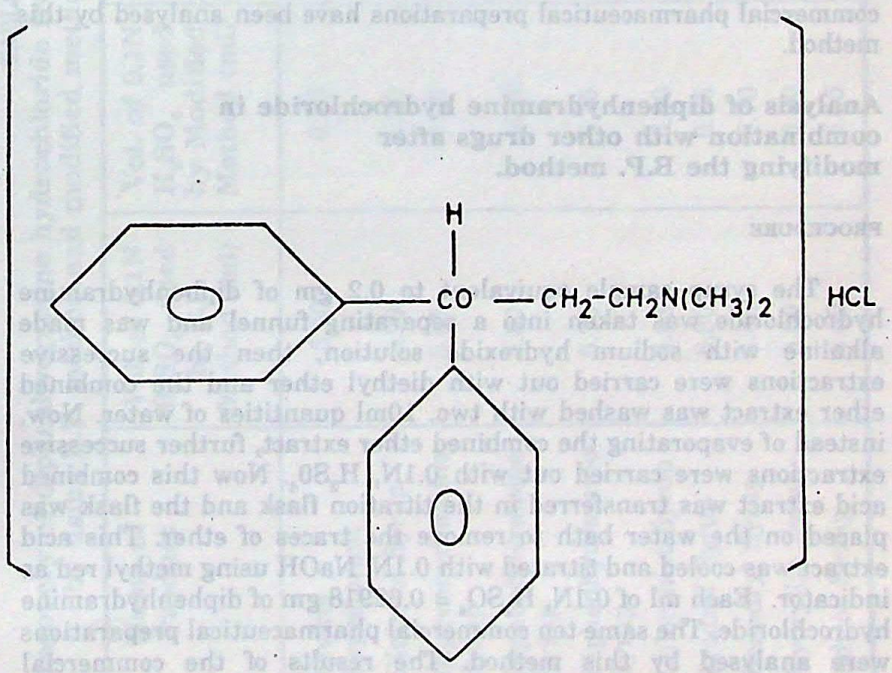

Fig. 1
Diphenhydramine hydrochloride ($C_{17}H_{21}NO$, HCl)

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The present investigations have been carried out to find out an accurate and rapid method, which could conveniently be used for the determination of diphenhydramine hydrochloride in commercial pharmaceutical preparations. For this purpose the current official acid base titration B.P. method has been modified.

Experimental

Reagents

i. Dilute hydrochloric acid.
ii. Sodium hydroxide solution (20% W/V)
iii. Sulphuric acid 0.1N.
iv. Methyl red indicator.
v. Diethyl ether.
vi. Sodium hydroxide solution 0.1N.

All the reagents used were of A.R. grade.

Acid base titrations B.P. method

Diphenhydramine hydrochloride in combination with other drugs was analysed by using current acid base titration B.P. method.[5] Ten commercial pharmaceutical preparations have been analysed by this method.

Analysis of diphenhydramine hydrochloride in combination with other drugs after modifying the B.P. method.

PROCEDURE

The syrup sample equivalent to 0.2 gm of diphenhydramine hydrochloride was taken into a separating funnel and was made alkaline with sodium hydroxide solution, then the successive extractions were carried out with diethyl ether and the combined ether extract was washed with two, 10ml quantities of water. Now, instead of evaporating the combined ether extract, further successive extractions were carried out with 0.1N, H_2SO_4. Now this combined acid extract was transferred in the titration flask and the flask was placed on the water bath to remove the traces of ether. This acid extract was cooled and titrated with 0.1N, NaOH using methyl red as indicator. Each ml of 0.1N, H_2SO_4 = 0.02918 gm of diphenhydramine hydrochloride. The same ten commercial pharmaceutical preparations were analysed by this method. The results of the commercial pharmaceutical products which were analysed by current official B.P. method and the modified method have been recorded in Table I.

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TABLE I

Recovery of diphenhydramine hydrochloride from Commercial Pharmaceutical Preparations by using B.P. method and modified method by taking sample equivalent to 0.2g.

S. No.	Name of Product	Vol. of 0.1N H_2SO_4 used by B.P. Method (ml)	Vol. of 0.1N H_2SO_4 used by Modified Method (ml)	Amount stated mg/5ml	Amount determined mg/5ml		% Purity	
					B.P. Method	Modified Method	B.P. Method	Modified Method
1.	Zevirol Expectorant	5.90	6.70	13.5	11.62	13.19	86.07	97.70
2.	Dipherol Syrup	5.90	6.80	13.5	11.62	13.39	86.07	99.18
3.	Diphenhydramine Syrup	5.85	6.85	13.5	11.52	13.49	85.33	99.92
4.	Diphenhydramine Syrup	5.80	6.60	13.5	11.42	12.99	84.59	96.22
5.	Diphenhydramine Syrup	5.70	6.75	13.5	11.22	13.29	83.11	98.44
6.	Chlorohist Syrup	5.85	6.80	13.5	11.52	13.39	85.33	99.18
7.	Prodryl Syrup	6.80	6.95	13.5	13.39	13.68	99.18	101.33
8.	Benadryl Syrup	6.40	6.70	13.5	12.60	13.19	93.33	97.70
9.	Hydryllin Syrup	6.80	6.90	8.0	7.93	8.05	99.12	100.62
10.	Adicos Syrup	6.50	6.75	8.0	7.58	7.87	94.75	98.37

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Discussion and conclusion

The analysis of diphenhydramine hydrochloride in combination with other drugs has been carried out by the current acid base titration (B.P.) and by the modified method and their results are given in Table I. The results of the pharmaceutical preparations which are analysed by the B.P. method indicate that the preparation from serial numbers 7 to 10 are within the B.P. specification but the results of the preparations from serial numbers 1 to 6 are below the normal limits.

During the analysis some of the oily matter was left behind after evaporating the ether. This oily matter interfered in the titrations. It is suspected that the low results obtained might be due to extractions and evaporation processes.

The results of the pharmaceutical preparations from serial numbers 7 to 10 are within the B.P. specifications indicating that these preparations most probably have been prepared by better formulation techniques. The present research work was carried out to obtain uniformly good results for all types of samples. For this purpose the official acid base titration method has been modified.

The extraction in the modified method is carried out in two steps. In the first step the syrup sample is made alkaline with sodium hydroxide solution and the extraction is carried out with diethyl ether for the separation of diphenhydramine hydrochloride, while in the second step, instead of evaporating the organic solvent, further extractions are carried out with 0.1N sulphuric acid and this acid extract is titrated against 0.1N sodium hydroxide using methyl red as indicator.

The results of the Commercial Pharmaceutical Preparations which are analysed by modified acid base titration method (Table I) indicates that the percentage recoveries of all the samples are within the B.P. limits.

It is evident from the above discussion that the modified acid base titration method is more suitable and it gives better results as compared to the current pharmacopoeial method.

REFERENCES

1. Bjarne, S. Titration of Purine Derivatives in Non-Aqueous Medium, *Medd. Norsk Farm Selskap,* 1957,19:199-209.

2. James, E.F. Martindale. *The Extra Pharmacopoeia,* Twenty-eighth Edition. The Pharmaceutical Society of Great Britain. The Pharmaceutical Press London, 1984, 1311-12.

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3. *Remington Pharmaceutical Sciences,* 17th ed., 1985, 1128.

4. Sudhindra, R. Analysis of Cough Remedy, *Indian J. Pharm* 1973, 35:33-5.

5. *British Pharmacopoeia,* 1988, 201, 732.

6. *British Pharmaceutical Codex,* 1973, 671.

7. Jack Wallace, E., John Biggs, D. and Dahl Elmer, V. Determination of Diphenhydramine and Certain Related Compounds by UV Spectrophotometry, *Anal Chem.* 1966, 38:831-34.

8. Tsubouchi, M. Spectrophotometric Determination of Diphenhydramine in Pharmaceutical Preparations, *Bull. Chem. Soc.,* 1970, 43:3164-6.

9. Tsubouchi, M. Spectrophotometric Determination of Organic Cations by Solvent Extraction with Tetrabromo Phenolphthalein Ethyl Ester, *J. Pharm. Sci.,* 1971, 60:943-5.

10. Mayo, C. Improvement in the Assay of Diphenhydramine HCl in Tablets, *Yaown Fenxizazhi* (China), 1983, 3:110-11.

11. Qian, S. Colorimetric Assay of Dramamine Tablets, *Yaown Fenxizazhi* (China), 1983, 3:118-20.

12. Temizer, A. and Ozaltin N. Polarographic Determination of Antihistamine by Complexation with Cadmium (CdII), *J. Assoc. Off Anal. Chem.,* 1986, 69:192-5.

13. Selig, W. and Fresenius, Z. Potentiometric Titrations of Organic Cations Precipitated by Tetraphenylborate, *Anal. Chem.,* 1981, 308:21-3.

14. Repin, V.A., Egorov, V.V. and Starobinets, G.L. Potentiometric Determination of Amine Drugs, *Zh. Anal. Khim.,* 1988, 43:1318-22.

15. Abramenko, L.L., Aristov G.N. and Ischenko, V.I. Gas Chromatographic Determination of Diphenhydramine hydrochloride in Dosage form, *Zh. Anal. Khim.,* 1988, 22:1014-16.

16. Abdel Moety, E.M. and Elbardicy, MG. GLC Determination of Diphenhydramine (Dimedrol) HCl in some Pharmaceutical Formulations, *Anal. Lett.,* 1985, 18:2155-72.

17. Abadi, H. TLC Determination of Diphenhydramine, Ephedrine HCl and Codeine Phosphate in Syrup, *Danesh Kade-ye-Darusazi* (Tehran), 1976, 1:53-7.

18. Mahato, S.B., Sahu, N.P. and Maitra, S.K. Simultaneous Determination of Chlorpheniramine and Diphenhydramine in Cough Syrups by Reversed Phase Ion Pair High Performance Liquid Chromatography, *J. Chromatogr.,* 1986, 351:580-4.

19. Sidhu, A.S., Kennedy, J.M. and Deeble, S. General Method for the Analysis of Pharmaceutical Dosage Form by HPLC, *J. Chromatogr.,* 1987, 391:233-42.

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TYLOSES
THEIR DEVELOPMENT AND IMPORTANCE

T.O. Siddiqi

Seasonal loss of organs is one of the well known process occurring in plants. This loss is brought about by the process of abcission. Leaves, floral parts, fruits and often branches may be shed, e.g. *Taxodium, Populus, Naucleopis* and *Perebea* (Koek-Noorman and ter-Welle, 1976). In some species e.g. in the tumbleweed, *Kochia indica,* the whole aerial part of the plant separates from the root (Zeroni *et al.,* 1978).

A lot of histological processes were observed during abcission, such as lignification of the parenchyma cells, tylose formation in the tracheary elements and callose deposition in sieve elements, not all of these processes in the same species (Poovaiah, 1974).

Balloon-like enlargements of parts of cell walls, projecting into adjacent cell lumina through pit cavities, are known as tyloses (singular tylosis). Tyloses are formed by the enlargement of the pit membranes of the half bordered pit-pairs between wood parenchyma or wood-ray cells and vessels or tracheids. The delicate membrane is expanded and grows, apparently by intussusception, pushing out of the pit-cavity and protruding far into the lumen of the non-living cell (Eames and McDaniels, 1947). Transverse sections of the secondary xylem of *Ficus infectoria* (Figs. 1-3) shows the development of tyloses (Siddiqi, 1984). The nucleus and part of the cytoplasm of the parenchyma cells, from which the tylosis is formed, enter the tylosis. Tyloses may divide. Although tylosis formation, is considered to be normal phenomenon, in many species it has also been found to be induced by mechanical injury and by diseases (Zimmermann, 1979).

After the tyloses are full grown, starch, crystals, resin and gum may be formed within them, but the presence of these substances in quantity is uncommon. The tylosis may remain small or become very large; its size and shape depend upon the size of the lumen of the tracheid or vessel into which it extends, and upon the number of other tyloses present. The wall of the tylosis may remain thin and delicate, becoming wrinkled and partially collapsed in heartwood, or may become thick and even lignified; pits may be formed in it when it comes in contact with other tyloses. Tyloses are of common occurrence in angiosperm wood. Tyloses occur in the vessels of herbs also. They

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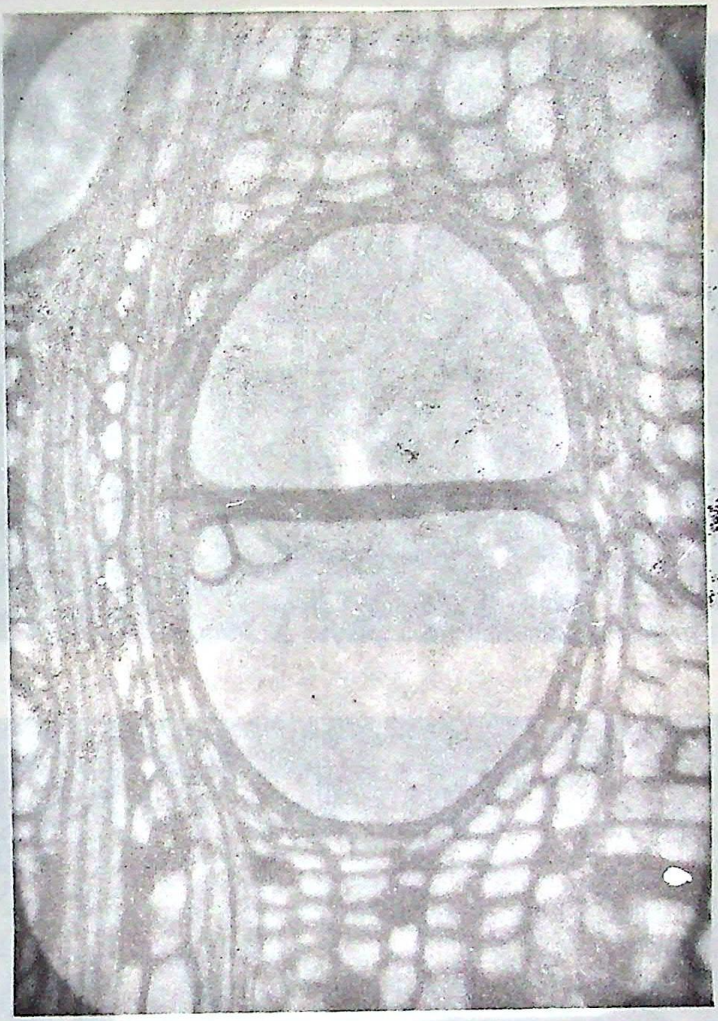

Fig. 1
Transverse section of secondary xylem of *Ficus infectoria* showing development of tyloses in the vessel x 100.

have been described in such genera as *Cucurbita, Coleus, Canna, Portulaca, Rumex, Asarum,* and *Convolvulus.*

Tyloses are of considerable economic importance in the use of woods. They are a factor in durability of woods. Durable species, with few exceptions, possess abundant tyloses e.g. *Maclura, Robinia, Juglans nigra, Morus, Catalpa* and the white oaks. By blocking the vessel lumina, they prevent rapid entrance of water, air and fungal filaments. The presence of tyloses prevents rapid penetration of artificial preservatives (Eames and McDaniels, 1947).

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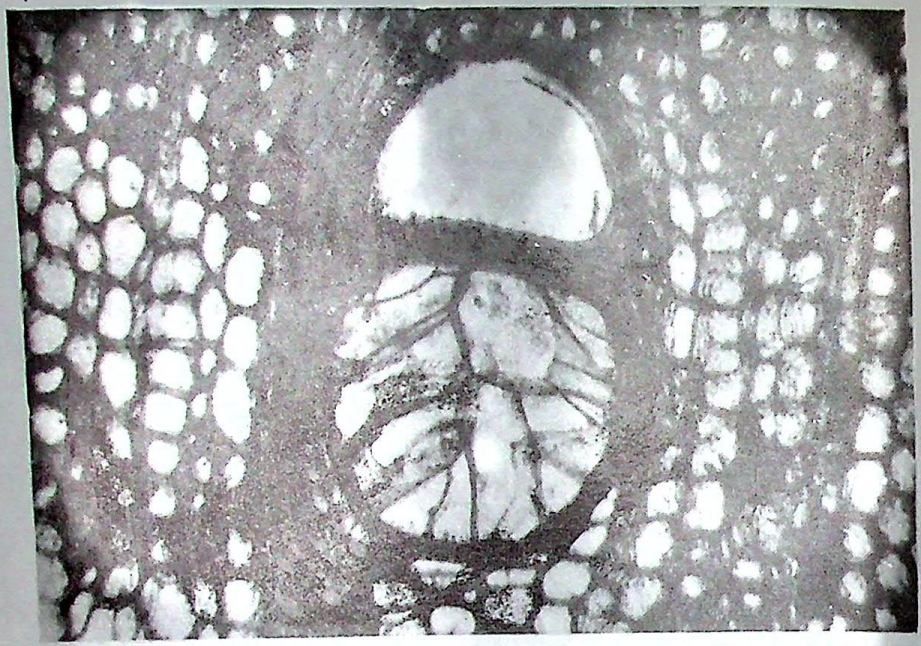

Figs. 2 and 3
Transverse sections of secondary xylem of *Ficus infectoria* showing vessels filled with tyloses x 100.

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REFERENCES

1. Eames, A.J. and McDaniels, L.H. (1947). *An Introduction to Plant Anatomy,* McGraw Hill Book Co., Inc. New York and London, pp. 220-222.
2. Koek-Noorman, J. and terWelle, B.J.H. (1976). The anatomy of branch abcission layers in *Perebea mollis* and *Naucleopsis guianensis* (Castilleae; Moraceae). *Leiden Botanical Series* 3: 196-203.
3. Poovaiah, B.W. (1974). Formation of callose and lignin during leaf abcission, *Am. J. Bot.,* 61:829-34.
4. Siddiqi, T.O. (1984). Studies on the seasonal activities of vascular cambium and secondary phloem in some Moraceae. Ph.D. Thesis. A.M.U., Aligarh.
5. Zeroni, M., Hollander, E. and Arzee, T., (1978). Abcission in the tumbleweed *Kochia indica:* ethylene, cellulase and anatomical structure. *Bot. Gaz.* 139:299-305.
6. Zimmermann, M.H. (1979). The discovery of tylose formation by a Viennese lady in 1845, *IAWA Bull. 1979,* (2, 3):51-56.

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EFFECTS OF NICOTINE ON PAIN AND AGGRESSIVITY AND ANTAGONISM OF THESE EFFECTS BY MECAMYLAMINE

Aydin Erenmemi şoğlu, Yalçin Tekol and Cem Süer

Introduction

Nicotine is known as a psychostimulant of the central nervous system and it is an addictive[1-3]. It causes psychic and may be physical addiction[3-5]. Previously it had been reported that nicotine increases pain threshold by affecting the central nervous system[6-9], has antiaggressive effect on several kinds of animals[10, 11] and anxiolytic effect on humans.[8, 9]

On the other hand mecamylamine, a central nicotinic antagonist, has been found to block effects of nicotine[10, 11]. We tried to show these effects of nicotine on mice objectively by simple methods, which don't need special equipments.

Material and methods

Swiss Albino mice, weight 20-35 g., bred in our laboratory, were subjected to the present investigations. Effects of nicotine were compared with the control group and validity of experimental methods was controlled by taking the known classic drugs as reference. We also investigated whether mecamylamine, a central antinicotinic substance, blocks the effects of nicotine or not.

Mice were separated into five groups, each included fifteen males for searching the analgesic effect. Drugs were dissolved in saline and injected subcutaneously. Ten minutes after the injections (30 min., later for metamizole group) 60 mg/kg acetic acid from a 0.6% solution was administered intraperitoneally to the animals for inducing pain. Writhing numbers of these animals were counted during the 30 min., period.[12] Experimental groups and drug doses have been shown in Table I. Nicotine dosage was calculated on base form for all experiments.

To investigate the antiaggressive effect of nicotine, just breed females and 25-30 days old pups (intruder) from both sexes, were used. The experimental method is a combination of maternal[13, 14] and isolation aggression methods[15, 16]. Initiation of pregnancy was

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determined by the presence of the vaginal plug[14]. On the 10th gestation day each female was separated into a home cage (40x20x10 cm). All subjects had free access to food and water. Their cage floors were covered with wood shavings. Experiments were carried out on the first day post partum.[13]

TABLE 1
Experiment groups of analgesia testing

Drug	Dose
Nicotine di tartrate (SIGMA)	1.25 mg/kg
Nicotine di tartrate	2.5 mg/kg
Metamizole (HOECHST)	50 mg/kg
Mecamylamine (SIGMA) + 15 min. after Nicotine di tartrate	2.5 mg/kg + 2.5 mg/kg
Serum physiologic	10 ml/kg

A 25-30 days old intruder was put into each cage which included just breed females and pups. The attacks of female on the intruder were counted and the total time of attacks were determined[13, 14].

Experimental groups shown in Table 2 include fifteen animals per group. Experiments were carried out 10 minutes (30 min., for chlorpromazine) after the drugs' administration.

Results were evaluated by student test.

Result

Nicotine caused a dose-dependent decrease (1.25 and 2.5 mg.kg) on writhing numbers of animals compared to control. ($p<0.01$) This effect was antagonized in the mecamylamine pretreated group. The results have been shown in Fig. 1.

In the aggressivity tests, nicotine (0.75 mg/kg) decreased the attack score and active attack times of females significantly ($p<0.05$), but there were no significant changes when the dose of 0.5 mg/kg ($p<0.05$) chlorpromazine was used as a method of control. Mecamylamine (2.5 mg/kg) antagonized the antiaggressive effect of nicotine. The results have been shown in Figs. 2 and 3.

Discussion

Previously, it has been shown that nicotine increases pain

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TABLE 2

Experiment groups of aggressivity testing

Drug	Dose
Nicotine di tartrate	0.5 mg/kg
Nicotine di tartrate	0.75 mg/kg
Chlorpromazine (ECZACIBASI)	1 mg/kg
Mecamylamine + 15 min. after Nicotine di tartrate	2.5 mg/kg + 2.5 mg/kg
Serum physiologic	10 ml/kg

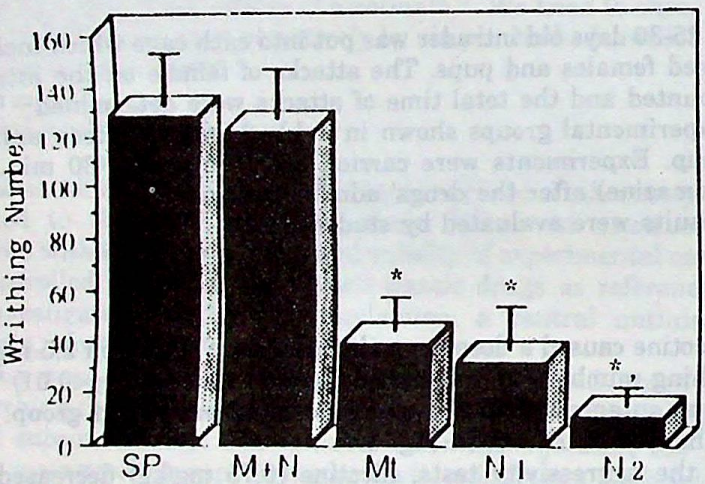

Fig. 1

Analgesic effect on mice: ± SD.

SP : Saline

M+N : Mecamylamine 2.5 mg/kg + Nicotine 2.5 mg/kg

Mt : Metamizole 50 mg/kg

N1 : Nicotine 1.25 mg/kg

N2 : Nicotine 2.5 mg/kg

* p<0.01 (Compared to SP and M+N groups)

\+ p<0.05 (Compared to N1 group)

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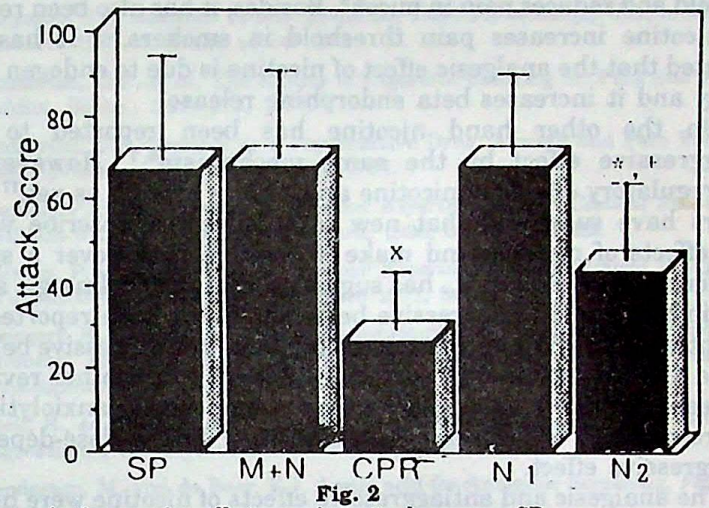

Fig. 2

Antiaggressive effect on mice, attack score: ∓ SD.

SP : Saline
M+N : Mecamylamine 2.5 mg/kg + Nicotine 2.5 mg/kg
CPR : Chlorpromazine 1 mg/kg
N1 : Nicotine 1.25 mg/kg
N2 : Nicotine 2.5 mg/kg
* p<0.05 (Compared to SP and M+N groups)
\+ p<0.05 (Compared to N1 group)
x p<0.01 (Compared to SP group)

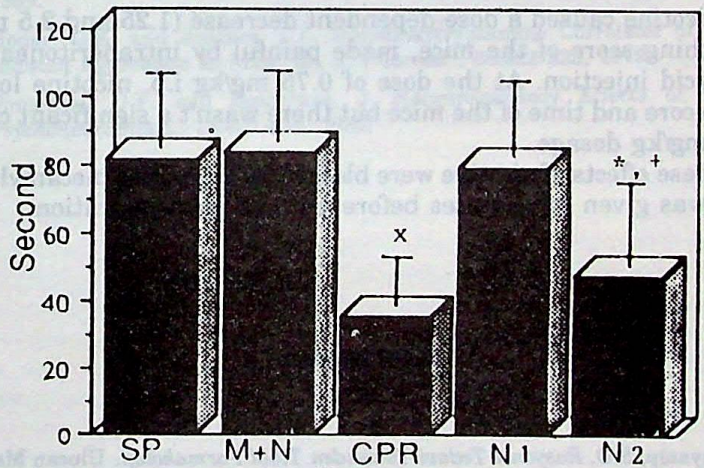

Fig. 3

Antiaggressive effect on mice, attack time: ∓ SD.

SP : Saline
M+N : Mecamylamine 2.5 mg/kg + Nicotine 2.5 mg/kg
CPR : Chlorpromazine 1 mg/kg
N1 : Nicotine 1.25 mg/kg
N2 : Nicotine 2.5 mg/kg
* p<0.05 (Compared to control and M+N groups)
\+ p<0.05 (Compared to N1 group)
x p<0.01 (Compared to SP group)

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threshold and reduces pain in mice[8,9]. Besides, it has also been reported that nicotine increases pain threshold in smokers.[6,7] It has been suggested that the analgesic effect of nicotine is due to endogen opioid activity and it increases beta endorphine release.

On the other hand nicotine has been reported to have antiaggressive effect by the same mechanism[6,7]. However, the neuroregulatory effects of nicotine aren't clear enough as yet.[17] Same authors have suggested that new techniques can describe various other effects of nicotine and make it possible to discover a specific locus for nicotine. Bell *et al.*, has suggested that the cholinergic system in brain has a role in aggressive behavior. It has been reported that the central muscarinic cholinergic system initiates aggressive behavior but the nicotinic cholinergic system inhibits it[11]. In another review, it has been described as a psychoactive, euphoriant, anxiolytic and reinforcer drug.[3] We observed that nicotine had a dose-dependent antiaggressive effect.

The analgesic and antiaggressive effects of nicotine were blocked by mecamylamine. This result also supports the inhibition of aggressive behavior by central nicotinic system. Behavioral effects of nicotine were investigated by several workers. However, the effects of the mechanism of nicotine is still unclear and it needs further studies.

SUMMARY

Nicotine caused a dose-dependent decrease (1.25 and 2.5 mg/kg) on writhing score of the mice, made painful by intraperitoneal (i.p.) acetic acid injection. At the dose of 0.75 mg/kg i.p. nicotine lowered attack score and time of the mice but there wasn't a significant change at 0.5 mg/kg dosage.

These effects of nicotine were blocked by 2.5 mg/kg mecamylamine which was given 15 minutes before nicotine administration.

REFERENCES

1. Kayaalp, S.O. *Rasyonel Tedavi Yonunden Tibbi Farmakoloji.* Ulucan Matbaasi, Ankara, 1986, 3. Baski, ss 2137-2149.
2. Cox, B.M., *et al.*, Nicotine Self Administration in Rats. *Br. J. Pharmacol,* 83:49-55, 1984.
3. Glover, E.D. *et al.* An Interpretative Review of Smokeless Tobacco Research in The United States: Part 2, *J. Drug Education,* 19 (1):1-19, 1989.
4. Julien, R.M. *A Primer of Drug Action,* WH. Freeman and Comp., San Fransisco, 1981, 3rd Edition, pp. 93-95.

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5. Kayaalp, S.O. *Rasyonel Tedavi Yonunden Tibbi Farmakoloji,* Ulucan Matbaasi, Ankara, 1987, 3. Baski, ss 247-257.

6. Pomerlau, O.F. *et al.* The Effects of Cigarette Smoking on Pain and Anxiety, *Addict. Behav.,* 9:265-271, 1984.

7. Pomerlau, O.F. Nicotine as a Psychoactive Drug: Anxiety and Pain Reduction, *Psychopharmal. Bull.,* 22:865-869, 1986.

8. Larson, P.S. and Silvette, H. *Tobacco: Experimental and Clinical Studies,* The William-Wilkins Company, Baltimore, 1968, Suppl. 1, p. 22.

9. Larson, P.S. and Silvette, H. *Tobacco: Experimental and Clinical Studies,* The William-Wilkins Company, Baltimore 1971, Suppl. 2, pp. 13-14.

10. Rodgers, R.J. Effects of Nicotine, Mecamylamine and Hexamethonium on Shock-Induced Fighting, Pain Reactivity and Locomotor Behaviour in Rats, *Psychopharmacol.,* 66:93-98, 1979.

11. Bell, R., *et al.* Drugs as Research Tools in Psychology: Cholinergic Drugs and Agression, *Neuropsychobiol.,* 14:181-192, 1985.

12. Anderson, M. and de Beer, E.J. Acetic acid for Analgesic Screening, *Fed. Proc.,* 18:412, 1959.

13. Ieni, J.R. and Thurmond, J.B. Maternal Aggression in Mice: Effects of Treatments with PCPA, 5-HTP and 5-HT Receptor Antagonists. *Eur. J. Pharmacol.,* 111:211-220, 1985.

14. Yoshimura, H. *et al.* Acute and Chronic Effects of Ginseng Saponins on Maternal Aggression in Mice, *Eur. J. Pharmacol.,* 150:319-324, 1988.

15. Krsiak, M. and Steinberg, H. Psypharmacological Aspects of Aggression: A Review of the Literature and Some New Experiments, *J. Psychosom. Res.,* 243-252, 1969.

16. Hodge, G.K. and Butcher, L.L. 5-Hydroxytryptamine Correlates of Isolation Induced Aggression in Mice, *Br. J. Pharmoc.,* 65:525-533, 1979.

17. Pomerlau, O.F. and Rosecrans, J. Neuroregulatory Effects of Nicotine, *Psychoneuroendoc.,* 14:407-423, 1989.

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THE CONCEPT OF TEMPERAMENT AND AGING

MIRZA ARSHAD ALI BEG

The Greco-Arab system of medicine has been examined with reference to the concept of temperament and compatibility and the elements air, water, earth and fire which have the properties of being cold, wet, dry and hot have been interpreted as endothermic, hydration, dehydration and exothermic reactions.

Compatibility of a substance with a living body has been suggested to be dependent on its being hydrogen bondable. Temperament of the living body is suggested to be its ability to maintain an optimum hydration level, a positive mass and energy balance as well as the elemental (chemical) and substrate balance and to reactivate the deactivated enzymes. In case of any imbalances, the life processes would be disturbed and the most favoured reactions that would predominate over others would comprise oxidative dehydration reactions which would give rise to a cold and dry temperament that would characterize aging.

Introduction

Life processes are governed by reactions which may be exothermic or endothermic i.e. they may either evolve heat or may absorb heat from the system to produce a cooling effect. The said processes may also produce water or may absorb water from the system and may produce wetness or dryness. These four types of reactions viz. exothermic, endothermic, hydration and dehydration were considered as elements which formed the key to life processes since the times of the Greeks. The process of Aging has in a previous paper been postulated to involve oxidative dehydration[1, 2, 3] in the micro-environment. It is proposed to examine the earlier philosophies in the light of the present postulates.

The medical papyri which are the oldest source of recorded history of medicine suggest that the Egyptians did not have a philosophy to explain the interaction of drugs with the human system to effect a cure although they were, during those times, faced with the same diseases as are prevalent now. The pattern of incidence does not seem to have changed in spite of the passage of several millennia. They were faced with internal and external parasites and hence suffered from gastrointestinal, genitourinary, rectal, cardiac, dermal

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ophthalmological, dental and uterine problems of the same nature as at present. Syphilis has neither been recognized nor accepted in ancient Egypt. Chronic arthritis and poliomylitis have been reported and so have cases of arteriosclerosis and calcification, gallstones, appendicial and pleural adhesions and bilharzia[4].

It is the remarkable ability of the human instinct not only to explain the difference between health and ailment but also in prescribing medicines and using poisons. It is interesting to note that throughout the recorded history of medicine, which dates back at least ten millennia before Christ, in the case of Egyptian medicine, its practice was empirical where the society had contact with civilization but was prone to ritual and magic therapies in primitive surroundings.

The diseases, according to the ancient Egyptians were caused by parasites. Their incidence was also correlated with weather, seasonal changes, prevailing winds and also meteorological phenomena.

Their methods of diagnosis of disease was sufficiently advanced and they could distinguish the disturbances of the chest, heart, tonsils, abdomen, liver, spleen, various tumours, etc. with precision by examining the pulse, palpation etc. They had thus devised their own means and ways to reduce the degree of empiricism in their methods of diagnosis.

The medicines prescribed by the Egyptians, as suggested by the medical papyri, also continue to be the same as at present viz., honey, castor oil, dates, figs, garlic, onion, aloes, opium, alcohol, parts of organs of animals e.g. fats, brain, blood, and minerals e.g. salt, alum, antimony, copper, soda etc. These medicines were prescribed in all the forms viz., pills, suppositories, emetics, enemas, poultices and ointments[5].

The Egyptian system of medicine became quite popular and did not remain confined to this country but crossed its borders. The same method of diagnosis and prescriptions with minor variations e.g. the relation with the movement of stars are noted in what is described as Assyro-Babylonian medicine[6]. These thought processes and traditions were passed on and penetrated into the Greek system.

The Greek medicine was greatly influenced by its philosophers who based their philosophies on observations and a constant study of nature and on the biological relationship of man with animals. For example, Thales in the 6th century B.C. proposed that water is the original principle of everything in the cosmos; it is the origin of all generations and the eternal element of every form of life and nature viz., of the plants, the seeds, animals and man. He thus came quite close to the present postulates.

Alcmaeon is another philosopher of the 5th century B.C. who philosophised that all substances which are constituents of the human body have to be in perfect harmony so that the human system could be in good health; any disturbance in harmony would give rise to a disease situation while the return of the disturbed state to harmony

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should be called cure[7].

Hippocrates is credited with the establishment of Hippocratic school of medicine which considers disease as a natural process, the symptoms as the reaction of the body to disease and the chief function of the physician to be assisting the body regain the natural forces and to restore the balance.

The four humour theory postulated by him suggests that the human body is formed of four elements; air, water, earth and fire. Earlier on Empedocles in 504-443 B.C. had proposed that the world was composed of the above four elements and that they are indestructible. He had held that health came from the harmony of these elements and disease from their disturbance. The same four elements according to Hippocrates possess the peculiar qualities viz. cold, wet, dry and hot respectively. The human body itself has four humours viz., blood, phlegm, yellow bile and black bile. These four together make up the nature of the body. The body is in perfect health when the four humours are perfectly balanced, any deficiency or their excess is indicative of ill health. The blood coming from the heart represents heat, the phlegm coming from the brain and subsequently diffusing through the body represents cold, the yellow bile secreted by the liver represents dryness while the black bile coming from the spleen and the stomach represents wetness[7].

With the passage of time the Hippocratic theory of four humours was forgotten. The Muslims, however, had in the meantime come into power and the Islamic state had its borders from India to Spain. Muslim philosophers, therefore, had the opportunity to interact with not only the Greek literature but also with that in Persia and India. Most of the Greek literature was, however, lost in the fire in Baghdad due to the holocaust of Chengez Khan. The great compilation by Ibn Sina in the form of *Al-Qanoon* which is an improvement on the work of Hippocrates soon filled the vacuum and had continued to be the text book of medicine in the European universities until the nineteenth century[8]. Ibn Sina accepted the concept of the four elements viz. air, water, earth and fire and the reactions which would be cold i.e. endothermic wet i.e. hydration, dry i.e. dehydration and hot i.e. exothermic in the modern sense.

The Temperament

The diagnosis of disease in the Greco-Arab system of medicine demands the knowledge of temperament of reactants which, in the present context, are the medicine and the human body. Everything which can react with another e.g. a drug with the human body or a pesticide with a plant is capable of causing a change in the micro-environment of the reactant and ultimately modifies its temperament. The change in the temperament is a result of change in the energy content of the system as well as mass. There is apparently some

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dissipation of energy and transformation of mass. The interaction, therefore, results in alteration of the energy as well as mass balance.

Ibn Sina has suggested that the various changes in the temperament of human and other living beings can be recognised under the following eight varieties:

(i) A general balance or pattern of the species as a whole,
(ii) Specific pattern of the most balanced individual of that species,
(iii) General pattern of the geographical place,
(iv) Specific pattern of the most balanced person of that race,
(v) The general pattern of an individual as against other individuals of the race,
(vi) The temporary balance or equilibrium of an individual which is the most suitable for his personal condition e.g. age or reason,
(vii) The general pattern of an organ as against that of other organs, and
(vii) The balance of an organ which is the most suitable for its own momentary state e.g. rest or activity[9].

The change in temperament with respect to age is as follows: The old and senile are balanced with respect to heat while the children and grown ups are somewhat cold. Children possess a moderate excess of moisture to meet their growth requirement. It may be added here that the young leaves have at least 6 to 16% higher moisture content. Both have soft tissues. Old and senile individuals not only have cold but dry temperament as can be observed from the hardness of their bones and dryness of their skins[9].

The concept of compatibility of the medicine with the body or their temperament started losing ground because the Muslim philosophers did not contribute much after Ibn Sina to the development of the Islamic medicine. Muslims fought shy of their own achievements and instead of consolidating on the gains of the past, were trying to learn from their own followers. For example Mohammad Ali of Egypt sent his team of physicians to France in 1832 to learn from their practice of medicine because physical and chemical principles were being applied by the European countries to medicine towards the beginning of the 18th century. Almost at the same time physiologists like Claude Bernard (1813-1878) laid stress on the function of organs and tissues in health and disease[10]. This was almost simultaneously accompanied by the science called pathology and persons like Virchow (1821-1902) stressed on the study of normal and abnormal tissues and correlated the anatomical observation with characteristic features of a disease. Pasteur (1832-95) and Koch (1843-1910) identified the microorganisms and laid the foundation of microbiology. They attributed the occurrence of a particular disease to specific organism,

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the anthrax to anthrax bacillus, tuberculosis to tubercle bacillus and lobar pneumonia to pneumococcus[10].

Then came specific therapies by prescribing the active principles isolated from infusions; Serpajmalin from *Rauwolfia serpentina* for hypertension, insulin from pancreatic enzymes for diabetes and liver extract for pernicious anaemia. Sulphonamides and penicillin appeared between 1935 and 1945 and made many diseases curable. This laid the foundation of modern medicine in biochemical sciences. Biology has been transformed from biological chemistry to molecular biology. The composition and function of the cells, organs, tissues and membranes have been translated in terms of molecular biology while biosynthesis of the vital materials in life processes have been elucidated.

The concept of temperament although still valid demands a reinterpretation in terms of modern developments. Perhaps the postulates of the Dehydration Theory of Aging particularly those concerning the role of enzymes, could be applied in this connection. It is interesting that Garrod was the first to enunciate the hypothesis that the primary action of genes is to control the synthesis of specific enzymes. The difference between the normal and a disease affected individual may be interpreted in the light of the postulate in terms of what may have happened in the micro-environment of the latter[2]. The disturbance in the micro-environment may be introduced by mutant genes and effect substitution of a single amino acid residue in the primary sequence of the proteins. The result may be observed in the abnormality of specific protein or in the deficiency of a specific enzymatic activity or in the synthesis of a structurally abnormal non-enzymic protein. The genetic alteration is demonstrated by the non-enzyme sickle cell haemoglobin which has a valine instead of glutamic acid residue in the B chain of haemoglobin. Identical or closely related syndromes may be determined by different mutant genes. The mutation may be at different loci or may occur at the same locus[10].

This observation can be extended to many disorders among the humans. There are a few hundred inborn errors which have been identified with the lack of a specific enzyme or are linked to abnormal enzymes or other proteins. Abnormal haemoglobins, which are over 240 in number have been shown to have a precise structural defect in the DNA of the mutant gene. Receptor abnormalities have been identified among the membrane cytoplasmic and nuclear receptors for hormones and so are the new diseases such as type-II hypercholesterolemia, nephrogenic diabetes insipidus. The discovery of endogenous peptides commonly known as endorphins, having analgesic activity is linked with the recognition of opiate receptors. They hold a positive chance of providing understanding of the limbic systems, affective states and addictions if they could be localized. Similarly cell hybridization and fast reaction measurements are such revolutionary techniques which provide strong support to the postulate

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which was previously applied to life processes in plants[1]. These observations bear out the proposal that many of the hitherto unexplained behaviour and disorders are a result of small disturbance in the micro-environment which brings about a change in the temperament.

Introduction of Changes in Temperament

It was mentioned in an earlier paper that it is important for the cell wall of a plant to keep it hydrated by extending the hydrogen bonding network in a given micro-environment and time frame. It is tempting to interpret the hydrogen bond network in terms of compatibility. Accordingly the hydrogen bondable organic solutes, and inorganic ions whose degree of hydration is high would be compatible with hydrated substances. Ionic imbalances are created due to excess supply over demand which finally give rise to apoplastic ion concentration. The resultant salt damage creates an imbalance in water relations of the neighbouring cells. Water is withdrawn from the protoplast and the consequent loss in the degree of hydration, loss of turgor and cellular desiccation lead to the death of the plant. Accordingly, the hypothesis suggests that cells can grow only if an optimum degree of hydration prevails to allow maintenance of turgor. It further points towards the continuous need for the uptake of hydrated ions and hydrogen bondable solutes through the roots and their despatch to the shoots.

The interaction of solids with liquids to attain hydrogen bondability or compatibility is apparent in chewing, which is also a hydration process, common among all animal species starting from the unicellular amoeba to man. They have a well defined system of assimilation of food by which they first reduce the latter to fine particles and impart them a large surface area so that interaction with water is facilitated and their biodegradation becomes possible. Materials that already contain a lot of water compatible with biological systems and hence are easily assimilated e.g. soups, fruit juices, fresh fruits and vegetables. Edible materials that are not easily digested without processing e.g. meat, dry vegetables, etc., have to be cooked, which again is a process of hydration.

In life processes tannage is analogous to attack by a toxin and hence disease may be redefined as a process which introduces cross linkages at a binding site. The toxin released by E. coli, for example, initiates a dehydration process in the stomach and consequently there is serious dysentery and loss of water due to flatulence. If the bond with the toxin and the cross linkage introduced by it can somehow be destabilized, detannage or detoxification would take place or, in other words, health would be restored. Water would be needed here to carry away the toxins from the bonding site. It is important that the water be of such quality as to help in the bonding process. For example, in

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case of chrome tannage, the aqueous solution should be acidic which condition is critical and if the same is altered, tannage would not take place. Similarly, several mineral waters having therapeutic value act by the introduction of small or large ions to displace and leach out the toxins and residues from certain tissues of the body. Detoxification is effected by the detannage mechanism using an appropriate aqueous solution or suspension of material of mineral or vegetable origin or a synthetic drug. An aqueous medium is necessary in all cases for making substances available in hydrogen bondable or compatible form to render them assimilable.

Once absorbed by a biological system, different toxic materials, hydrogen bondable i.e. compatible or otherwise, act differently. They may either be distributed into specific tissues or through a series of metabolic steps, interact with multifunctional ligands such as proteins. The entering chemical may ultimately be bonded to one of the sites which has affinity for it or may be excreted through the roots of plants and in the case of the mammals through kidney, respiratory tract or sweat glands. The chemical could also be made compatible through a biotransformation mechanism by specific or non-specific enzymes present in different organs.

Mechanism for Modification of Temperament

The mechanism of a material becoming compatible to a living system by modifying its temperament may perhaps be demonstrated by its uptake or assimilation by the body. There may be several pathways through which the material may enter the system, they may be through the nose, mouth, skin or blood. The air when it is fresh is highly compatible but even fresh air may contain dust, pollens and allergens. Polluted air may contain other gases which may not be compatible with the system. These gases and air contaminants reduce the oxygen carrying capacity of the blood. The following equation reflects the blood picture:

$$tHb = CO_2 + cRHb + cCOHb + MctHb \ldots (1)$$

There is a substantial reduction in the oxygen carrying capacity if the dyshaemoglobins form a part of equation (1) because the latter are non-carriers of oxgyen[11]. Carbon monoxide and particulate matter present in the air in the vicinity of industrial and transportation activity may lead to formation of carboxyhaemoglobin in the blood of residents and workers in the neighbourhood and to the deposition of the particulate matter in the respiratory pathway. Both the substances are not expected to be compatible with the life processes of the organism exposed to the polluted air. Consequently there might set up a mechanism to reverse the toxic effects of the gas and solid which may have entered the body. This is effected by the multifunction oxidase

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enzymes. This suggests that the centres of enzymic activity must be functional and sufficiently effective to deal with the situation and thus be able to maintain the balance and hence maintain the temperament of the body.

Fuels and foods were related to one another long time ago by Lavoisier who suggested that both were composed of carbon, hydrogen and oxygen and that their oxidation to form carbon dioxide and water generated a characteristic amount of heat. It is well known that the heat value or caloric values of different substances are not the same. The heat of combustion of glucose, fructose, sucrose and starch is 3.73, 3.76, 3.95 and 4.12 calories per gram respectively. For butterfat, cotton seed oil and cod liver oil, it is 9.30, 9.40 and 9.40 and for gelatin, albumin and dried muscle it is 5.30, 5.80 and 5.40 cals. per gram respectively. On an average the heat of combustion proposed for carbohydrates, fats and proteins are 4.1, 8.9, and 4.1 calories per gram and this is known as their physiologically available energy. Input of the above nutrients obviously alters the temperament of the body[11].

Metabolism implies the chemical changes, within tissues, which lead to growth, production of heat and supply of energy for vital processes. Catabolism or chemical changes leading to breakdown of molecules release energy. Anabolism or changes which lead to synthesis on the other hand require energy. The former process heats the body while the latter has a cooling effect.

The energy required to maintain the body functions called basal metabolism viz. supporting the movement of the heart, respiratory organs, the guts, the maintenance of body temperature and synthetic reactions that occur in tissues e.g. formation of proteins, hormones, require 500 calories during 8 hours of rest or sleep. During the remaining 16 hours of work the requirement of energy would be 1000 calories. Adding 500 calories for non labour activities like feeding, washing, walking, and 800 calories for the days work by a clerk or student or one with sedentary habits, the total energy requirement is 2800 calories. For a miner or athlete or one doing heavy labour, the requirement could be as high as 2000 calories and the total may be a high of 4000 calories. The last named class of persons would, therefore, have a hot and dry temperament[12].

The protein molecule is first hydrolysed into the constituent amino acids which are absorbed from the small intestines only if they are needed by the body. Proteins are species specific and those which are not needed may be retained only for a short period and rejected thereafter. A number of injections of such proteins may establish immunity with the formation of an antibody called precipitin which causes its precipitation. A subsequent injection after a few days of the last injection produces anaphylaxis, a very serious toxic state which could be fatal. The sensitivity of persons to certain proteins e.g. shellfish and milk result in skin eruptions and sometimes edema.

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Such foreign proteins either enter the blood stream in an unchanged or partially degraded or digested condition or through inhaled air into the respiratory tract[13].

Organisms which can easily detoxify the pollutants can be classified as (1) whose system is compatible and (2) whose system is not compatible. Among the compatibles also there would be sub-classifications with regard to the level of tolerance.

The detoxification process deactivates the enzymes and if the population of deactivated enzymes somehow increases, the compatibility would decrease simultaneously. It may, therefore, be inferred that compatibility is a function of reactivation of deactivated enzymes and retrieval of denatured proteins.

The synthesis of specific enzymes and its control is the primary role of the genes. Deficiency in the specific enzymes may be created either by slowing down their synthesis, by creating a defect in the control mechansim of their bio-synthesis or through inheritance[14].

Genes can bring about alterations in proteins in such a manner that there is no uptake when a trace element is offered to them. They can introduce substitution of a single amino acid residue in the primary sequence of a protein molecule.

This observation suggests the importance of genetic factors in not only the synthesis of proteins but also the uptake of trace elements for the synthesis of enzymes. The primary role of element in health and disease is, therefore, to provide to the substrate, material for the synthesis of specific enzymes. The non-availability of the elements would create a deficiency which would surface up in the form of an imbalance due to deficiency of the specific enzyme.

Conclusion

The above analysis suggests that compatibility of a substance with the living organism is governed by a host of factors some of which are (i) its hydrogen bondability so that it can enter the living system and (ii) its assimilability or digestibility so that on being catabolised, its different moieties may be appropriately absorbed by the body. The living system on the other hand would be able to maintain its temperament if (i) it has the capability to manage an optimium degree of hydration in the micro-environment so that the life processes maintain a positive balance, (ii) its centres of enzymes activity are well balanced and the deactivated enzymes are reactivated and (iii) the mass and energy balance are positive and the elements and substrates are immaculately balanced so that the body reactions take place without hindrance. Failure to obtain or maintain these balances would allow the oxidative dehydration reactions to predominate with the result that the body would gradually acquire cold and dry temperament and aging symptoms would surface up.

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REFERENCES

1. M.A.A. Beg, (1989). Plant Growth/Aging in Saline Environment, *Pak. J. Sci. Ind. Res.*, 32, 163-74.
2. M.A.A. Beg, (1990). Theoretical Approach to Life Processes, Postulates of the Processes on Aging, *Pak. J. Sci. Ind. Res.*, 33, 92-101.
3. M.A.A. Beg, (1991). Changes in the Micro-Environment and Aging, *Hamdard Medicus*, 34 (1), 5-14.
4. The Theory and Practice of Old Egyptian Medicine, in *Theories and Philosophies of Medicine*, ed. Hakeem Abdul Hameed, Literary Research Deptt., Delhi (1962), pp. 7-16.
5. Hakim Mohammed Said, (1975). *Traditional Greco-Arabic and Modern Western Medicine: Conflict or Symbiosis*, pp. 2-5.
6. *Op. cit.*, 4, Mesopotamian Medicine, pp. 17-39.
7. *Op. cit.*, 4, Philosophy and Practice of Greek Medicine, pp. 53-70.
8. *Qanoon-e-Asri*, Part I, 2nd edn., Hakim Mohammad Ajmal Khan, Jayyed Barqui Press, Delhi, (1976), p. 7.
9. M.H. Shah, (1962). *Op. cit.*, 4, The Constitution of Medicine, pp. 92-140.
10. J.B. Wyngaarden, (1979). Biological Science and Medical Practice in *Cecil Textbook of Medicine*, eds. P.B. Beeson, W. McDermott and J.B. Wyngaarden, pp. 6-8.
11. M.A.A. Beg, (1991). Stresses in Micro-Environment of the Respiratory Systems and Initiation of Aging, *Hamdard Medicus*, 34 (3), 5-15.
12. C.C. Lucas and J.H. Ridout, (1967). *Composition and Energy Content of Foods: General Metabolism, in the Physiological Basis of Medical Practice*, eds., C.H. Best and N.B. Taylor, Asia Edn., Igaku-Shoin Ltd., pp. 1263-90.
13. J.M. Salter, (1967). Protein Metabolism, *op. cit.*, 12 pp., 1291-96.
14. A.G. Bearn, (1979). Inborn Errors of Metabolism and Molecular Disease, *op. cit.*, 10, pp. 40-44.

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TRADITIONAL SINGLE DRUG ADMINISTRATION FOR THE PSYCHOSOMATIC DERMAL DISEASES
I. PSORIASIS

Abdul Atique and Muhammad Iqbal

Introduction

Every physician admits the role of psychological factors in the onset and progress of an illness. In this sense, all diseases are psychosomatic, involving both *psyche and soma* to a greater or lesser degree. Any physical illness has its mental counterpart and the *vice versa*. The commonly recognised psychosomatic conditions, according to the dermatological clinical manifestations, include (a) urticaria, (b) psoriasis, (c) eczema, (d) angioneurotic oedema, and (e) neurodermatitis etc. The modern medical science has done pretty well in the field of dermatology, and several such drugs as antihistamines, antibiotics, and steroids have been evaluated for skin diseases. However, many cases of dermal disorders are still envisaged to be incurable. At this juncture, the traditional or indigenous medicines often prove to be a divine boon and help patients to get rid of their ailments.

Of the above cited dermal ailments, psoriasis is a chronic recurrent papulosquamous skin disease, causing grey scaling papules or flakes, dryness, and skin eruptions. Sometimes, the dry dermal flakes are as prominent as fish scales. The patient becomes puzzled, and short-tempered. This condition can be controlled by administering the various parts of *Karanj* or *Karanjivah* plant as a drug.

Plant description

Botanical name: *Pongamia pinnata* Linn. syn. *P. glabra* Vent.

Family: Papilionaceae; It is called *Karanj* or *Karanjivah* in Hindi/Urdu, *Aktenmakat* in Arabic, *Pongam* in French and Indian beech or garland of night in English.

Distributed all over India, especially near the coast, from the central and eastern Himalayas to Ceylon (Sri Lanka), this is a medium sized, glabrous and deciduous tree with a short bole and spreading crown. Leaves are imparipinnate with 5-7 ovate or elliptic leaflets (Fig. 1); bark greyish green or brown, smooth or covered with tubercles (Fig. 2); flowers lilac or white, tinged with pink or violet, fragrant, in

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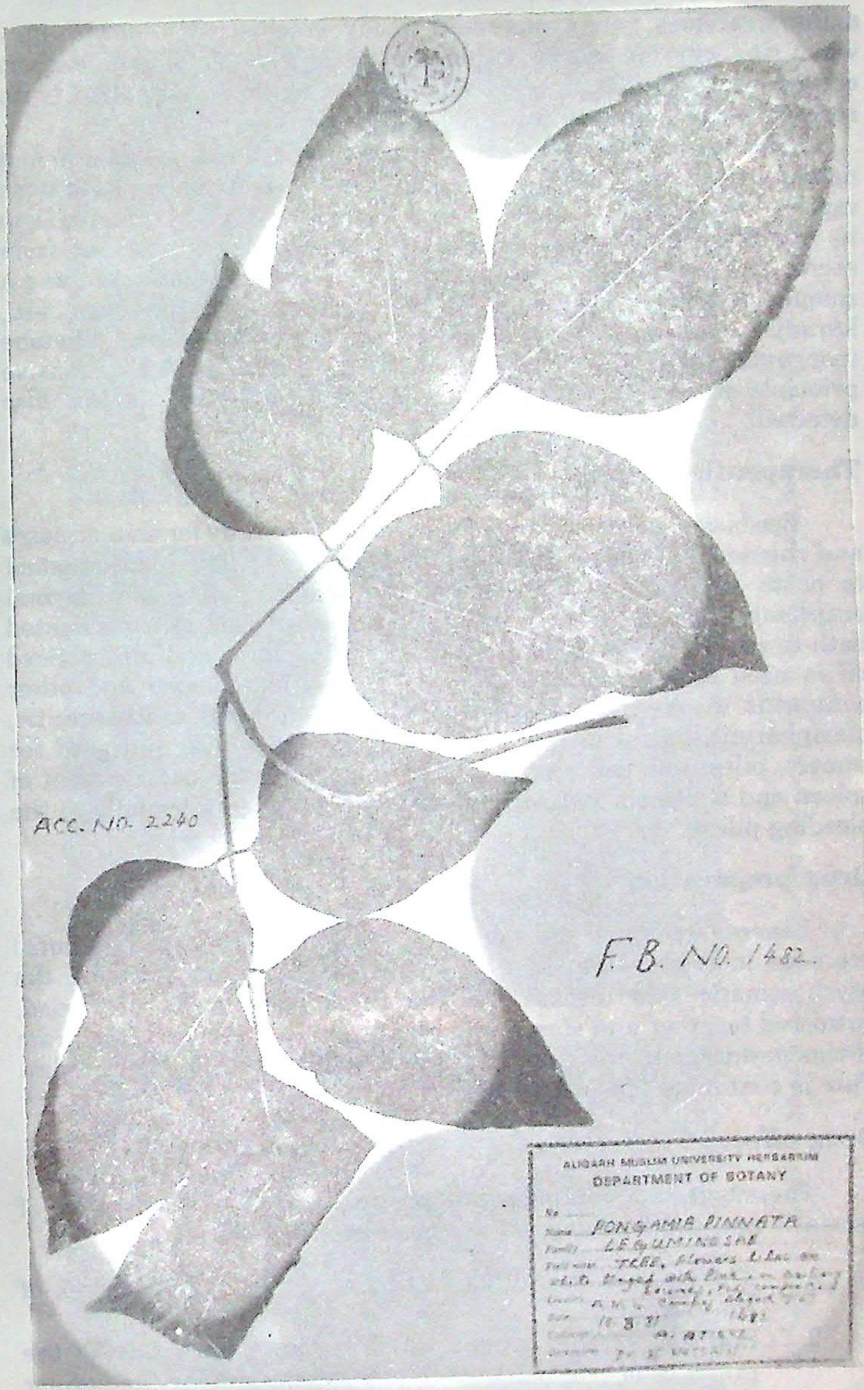

Fig. 1
Compound leaves of *Pongamia pinnata* showing imparipinnate arrangement of leaflets.

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axillary racemes; pods compressed, woody, indehiscent, yellowish grey when ripe, varying in size, elliptical to obliquely oblong, with a short curved beak (Fig. 2C); seeds elliptical or reniform, wrinkled, with reddish brown leathery testa, 1-2 per pod[2].

The bark of root and stem contains two flavonols — kanugin and demethoxykanugin. Chromenoflavone and pongachromene have been reported from the stem bark. Tetra-o-methyl-fiscitin was reported both in root and stem bark of *P. glabra*[8, 9]. Pongam oil is obtained from seeds. The seeds contain a mucilage, traces of an essential oil, and a complex amino acid known as glabrin. Four furanoflavones, viz., karanjin, pongapin, kanjone and pongaglabrone, and one diketone (pongamol) have been isolated from the Indian seeds. A hypotensive principle and a substance causing uterine contractions are also detected[2].

Therapeutic uses

Seeds and leaves are frequently used as a remedy for skin diseases and rheumatism and to destroy worms in sores[5, 6]. The seeds crushed to paste are used on leprous sores, rheumatic joints and dermal eruptions. A hot infusion of pongamia leaves is used as a medicated bath to relieve rheumatic pains and clean foul sores and ulcers. Seed oil is used as a remedy in scabies, herpes, leucoderma and other cutaneous diseases[1]. The bark is hot, bitter, acrid, anthelmintic, alexipharmic, useful in eye, vagina and skin troubles, and good for tumors, piles, wounds, ulcers, itching, axiles and the enlargement of spleen and abdomen. Pulp of the fresh bark is given internally in the bleeding piles[3, 4, 6, 7, 10].

Drug preparation

Leaves, seeds and the stem bark of *Karanj* (*Pongamia pinnata*) are used in combination as a single-drug remedy for psoriasis, the psychosomatic skin disease. All the three plant parts are dried, powdered together and stored in a glass container (bottle). One gram of this powder with fresh water is given to the patients thrice a day. This is continued for several weeks.

Drug effect

The suggested treatment has shown to be an effective cure of psoriasis and the following effects have been noticed:

1. The patient feels a marked relief within the first week of the treatment.
2. Stomach of the patient which is quite hard due to the presence of eruptions, gradually softens ridding the patient from pain that was due to stretching of muscles.
3. The patient loses weight during the treatment.

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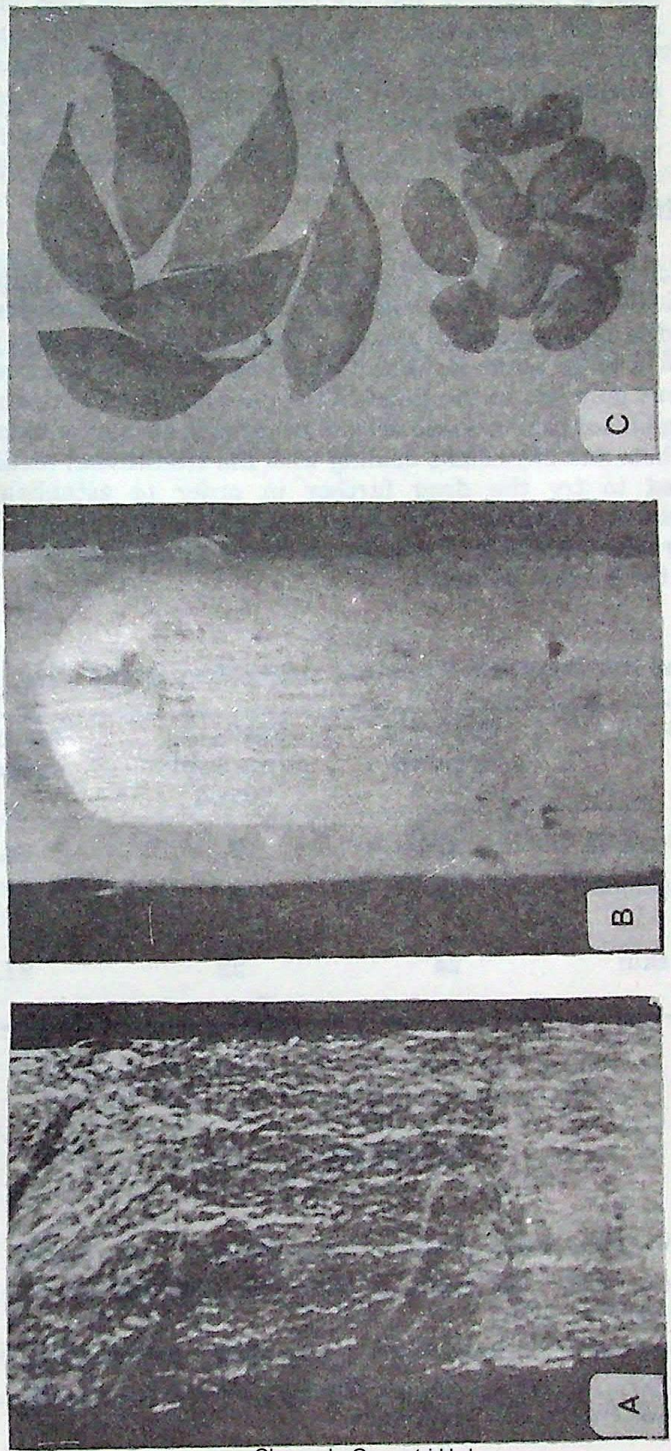

Fig. 2 (A–C)
Bark of *Pongamia pinnata* showing outer (A) and inner (B) surfaces, and the pods and seeds (C) of the tree.

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4. Mental heaviness and the lack of confidence that prevails over the patient before the treatment gradually disappears.
5. Dermal eruptions, scars and scaly formations are considerably reduced during two months of treatment.
6. The patient is usually free from psoriasis within three months period and the symptoms do not recur in general.

Concluding remarks

The clinical trials have been made on a few patients suffering from psoriasis and other psychosomatic skin disorders, and the drug has proved to be a successful remedy (Table I). However, it is yet to be used on a large scale. External application of suitable antiseptic preparations may add to the relief to the patient. Some patients also develop high blood pressure and need to be given some sort of sedatives. The herbalists and physicians dealing with the tradiltional medicines are advised to try the drug further in order to establish and authenticate its usefulness. The drug should then find its due place in the pharmacopoeia among traditional single drugs that are known to combat the human ailments.

TABLE I

Efficacy of the treatment against psoriasis/dermal disorders

Symptoms	Patients treated	Patients completely cured	Per cent success
Dry dermal scales	11	6	54.5
Dermal eruptions and scars	14	8	57.0
Dryness of skin and itching	24	22	91.7

REFERENCES

1. Ainslie, W. (1813). *Materia Medica of Hindoostan,* Govt. Press, Madras.
2. Anonymous, (1969). *The Wealth of India, Raw Materials,* Vol. 8, CSIR Publications, New Delhi.
3. Anonymous, (1986). *The Useful Plants of India,* CSIR Publications, New Delhi.
4. Chopra, R.N., Nayar, S.L. and Chopra, I.C. (1956). *Glossary of Indian Medicinal Plants,* CSIR Publications, New Delhi.

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5. Dutt, U.C. (1932). *The Materia Medica of Hindustan*, Madan Gopal Dass, Calcutta.

6. Dymock, W., Warden, C.H.J. and Hooper, D. (1889). *Pharmacographia Indica*, Vol. I, B. Singh and M.P. Singh, Dehra Dun.

7. Kirtikar, K.R. and Basu, B.D. (1975). *Indian Medicinal Plants*, Vol. III, B. Singh and M.P. Singh, Dehra Dun.

8. Mukherjee, S.K., Sarkar, S.C. and Seshadri, T.R. (1969a). Natural occurrence of tetra-o-methyl-fiscitin in root and stem barks of Karanj. *Indian J. Chem.*, 7:1275.

9. Mukherjee, S.K., Sarkar, S.C. and Seshadri, T.R. (1969b). The structure and synthesis of Pongachromene: A new component of *Pongamia glabra*, Tetrahedron 25:1063.

10. Nadkarni, A.K. (1954). *Indian Materia Medica*, Popular Book Depot, Bombay.

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SPICES IN MEDIEVAL ISLAM
A Perspective

Sami K. Hamarneh*

Introduction

Climate, position, and good soil helped to make southeastern Asia and the islands bordering the coasts thereof, the oldest and the principal scene of international trade in ancient times. The main articles of exchange then were spices and aromatics to which primitive man was attracted by their alluring scent. Their uses extended from that of seasoning food to medicinal application to a wounded warrior or for the easing of the pains of the sick, to the making of unguents, holy oils, perfumes and cosmetics, to the embalming of the dead and the performing of religious rites, and to the flavouring of wines and in the practicing of incantation and magic. Their consumption increased gradually with the increase of prosperity, population, means and ease of transportation and luxury.[1]

Records show that victors in ancient games were crowned with wreaths of laurel leaves before applauding multitudes; maidens primming sprigs of anise to pillows, keeping away unpleasant dreams and mothers planting sweet basil on the grave of a departed son. Moreover, these products were associated with purity and immortality as their sweet fragrance spread by fumigation to overcome evil.

The caravan road led from Attock, at the junction of the Kabul River with the Indus, via Cabura either to Samarkand or to Eclatana in Media, and thence, by way of land routes crossed the Tigris to Babylon on the Euphrates where the most important bulk of early antiquity's commerce met. In later periods, the water routes were directed from the far southeast areas to Babylon and Egypt. Herein, the Phoenicians, since 1500 B.C., expanded very greatly the world's commerce, and for a thousand years were the principal link between East and West.[2]

From the medical side also, man, since the dawn of history due to physical need and health protection, collected and traded drug plants as well as spices. In importing and using these plants and spices, civilized nations discovered the value of these herbs, and

* In remembrance of 24th December 1957 in Madison, Wisconsin, U.S.A.

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therefore, tried to cultivate them on their soil. The first recorded attempt of this kind in Egypt was that of queen Hatchepsowet of the twentieth century B.C. who sent an expedition to bring olibanum and probably myrrh and henna which were cultivated in the temple gardens of Karnak. A little later in Babylonia, Hammurabi *ca.* 1900 B.C. encouraged the cultivation of exotic plants and established herb gardens of medicinal plants. Also, the Phoenicians *ca.* 1100 B.C. cultivated medicinal and dietetic plants and were, many centuries later, followed by the Greeks.[3] Other records show that the Babylonians grew many spices in their gardens in the eighth century B.C. such as cardamon, coriander, dill, garlic, onion, thyme and saffron[4].

One of the oldest recorded perfume formulae is found in the Bible and contains the following ingredients: pure myrrh, five hundred shekels; sweet cinnamon, two hundred and fifty, sweet calamus, two hundred and fifty; Cassia, five hundred shekels and of olive oil, an hin. This was made according to the art of the apothecary into a holy anointing oil.[5]

Ancient Arabian Spice Trade

Favoured by the Persian Gulf on the East and the Red Sea on the West, southern Arabia, at an early date acquired special importance and conducted a lively international trade between the spice islands India and China on the one hand and the Middle East on the other. Then, the spice caravans winded their way across hot desert sands to Babylon, Damascus and Egypt. The main stopping places were Marib, Makkah, Elath (Aqabah) at the northeastern end of the Red Sea, Petra and Kir Moab.

These ancient Arabians who controlled maritime trading routes as well as land routes, held a monopoly in spice and aromatic trades with the East. Their hegemony brought with it material basis for the growth of large cities.[6]

Frankincense, myrrh and other fragrant gums and resins were found in abundance in the southwestern corner of Arabia and in Ethiopia which were the starting points for trade with ancient Egypt through the Red Sea, and with the Babylonians and Assyrians through the Persian Gulf and then inland over the Tigris and Euphrates rivers. This, most probably, marked the foundation of the maritime history of the Arabians, as they learned building their ships following the Egyptian pattern they saw. As a result of this international spice-trade, the culture of other lands filtered into this area and a new civilization came forth with the accumulated riches. Long voyages have been undertaken to the Orient by these Arabians who soon developed great skill, as keen and competent sailors.[7]

The history of the remarkable civilization in southwest Arabia could be regarded under the three kingdoms that ruled the area

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consecutively. The first is the Minaean kingdom which flourished from *ca.* 1300 to 650 B.C. in the area between Najran and Hadramawt. In its heyday it embraced most of South Arabia. The second and the greatest is the Sabaean kingdom which continued until 115 B.C. The capital city, Marib, which lay 3900 feet above sea level was a meeting place for the trade routes connecting the frankincense lands with the Mediterranean ports. Three citadels in the city, a great dam construction, and other public establishments reveal a progressive, peace-loving social system, highly advanced in commerce and in technical accomplishments. The third kingdom was the Himyarite which lasted till 300 A.D. and inherited the Minaean-Sabaean culture and trade.[8]

In the time of these kingdoms, spices and aromatics became items of trade which were used in the rites of the Tabernacle by the children of Israel, and as gifts to King Solomon in Jerusalem in the 10th century B.C., to the Assyrian Sargon II (724-705 B.C.) and to the Persian king Darius of the sixth century B.C.

While the Phoenicians were notable manufacturers and grand traders of all kinds of merchandise, including spices, the Arabians in the southeast of the peninsula inherited spice trade as their mainstay on which they entirely depended for their livelihood. Therefore, according to Parry, these Arabians must have been the first nation to bring cinnamon fragrant barks and cassia, not from Ceylon, but from China, in ancient times, hence, called China bark. Cinnamon from Ceylon was not mentioned until late in the Middle Ages. Moreover, this oriental source was kept secret by the Arabs, who successfully monopolized the spice trade and for centuries continued to be the emporium of spice trade in the ancient world.[9]

Greek and Roman Period

In the social life of the ancient Greeks and Romans, spices were the essence of personal luxury. Wines and oils therefore, were also spiced. Among their kitchen implements, they had mortars and pestles in which to pound and powder the spices which they used in cooking and flavouring.

Hippocrates (*ca.* 460-370 B.C.) described anise, coriander, thyme, mint and garlic for medical purposes. Later, in the time of the Ptolemies, trade between Egypt and India increased considerably, through the Arabian mediatory handling, and this increase continued in the time of the Romans, who derived in return much revenue out of this trade. Many drug plants were also brought together with the spices, and a good number of these are still in use even at the present.[10]

In the first century A.D., Dioscorides, a contemporary of Pliny the Elder, described the usefulness of a variety of spices and their medical application in his monumental work *The Materia Medica.*

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By the third century A.D., while the Roman Empire was still in power, the Arabians developed a direct sea trade with China and the East Indies.

In the fourth century A.D., the newly founded capital of Constantine, became a great center of spice trade. But in this century and the following, wars and other disturbances of the commercial intercourse along the old caravan routes frequently restricted traffic to the rivers and seas. However, upon the re-establishment of peace, commerce resumed its natural course.

Later, the Persians, in the time of the Sassanid Empire took advantage of the improvements of the highways, and the construction of new roads, to increase their trade with China and India in land as well as the sea routes.

But, in general, from the sixth century to the early Renaissance, the development of aromatics and drug plants was carried once more by the Arabs and the Persians, [11] who left also their imprint on the terminology of these products.

The Islamic Empire

Makkah, by the sixth century, was a focus of trade, due to its position on the main route from the Mediterranean to the Red Sea and the Indian Ocean. The town was strong enough to protect its wealth and freedom of trade from the Bedouin raids. Added to its wealth was the income obtained from the pilgrims who flocked annually to the Ka'bah where several shrines and altars for the gods were erected for worship.[12] Here, in Makkah, early in the seventh century, Islam arose and triumphed and as a result, the Arabs spread a common religion, language and economic life. And before the middle of the seventh century came, all of Syria, Palestine, Egypt and Persia fell into the hands of the Arabs who consequently became the heirs of these lands' heritage, of culture and commerce.[13]

During the seventh and eighth centuries, the Arabs carried out an extensive sea trade with India and China, especially in spices and aromatics. Much of that was brought in large quantities to the luxurious courts of the Caliphs in Damascus and in Baghdad, and to the Byzantine Emperor at Constantinople.

Not much later, we find Arabian merchants settling also along the Malabar coast, in Ceylon, and in the Indian sea ports. From the eighth to the tenth centuries, Daybal, at the mouth of the Indus became an important commercial center and an Indian sea port of note. Hence it was the principal emporium for the products of the Indus valley and the Punjab on one side and the Eastern Caliphate domains in Baghdad, Persia and the Arabian peninsula on the other. On the southeast of Arabia, Suhar and Muscat developed as rival ports for the oriental trade, and on the southwestern coast, Aden, after the year 800 A.D. became the principal port and the commercial

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center to link the eastern African coast and the southern part of the Arabian peninsula with the Middle East.[14]

In North Africa an active coastline trade developed having its centers in Syria and Egypt and extending as far as Morocco and Spain. This trade acquired a special importance for spices and aromatics. Until the twelfth century, there also existed several land routes across the Suez isthmus where the centers of exchange became Jerusalem and Damascus.

Further Development under the Caliphs

For the advancement of trade and prosperity, the Arabs built a new system of coinage based on the quarter of the Aegina states of the Byzantine Empire. This became the Arabic gold dirham which in turn was divided into sixteen kirat. This system passed to Europe by means of trade, in the medieval period, under the general name of Troy weight.

Under the Abbasid dynasty the silver dirham reached and maintained a weight of 45 grains. This Arabic system in 791 A.D. was adopted in England.[15] An indication to the far reaching of Arabian trade to northern Europe is the enormous number of Islamic coins found in Russia, Finland, Sweden, England and Ireland. A major part of this adventurous trade was for spices and aromatics[16] sales.

In the ninth century, Islamic navigation had already reached its widest extent. The Indian Ocean was the field of great enterprise. The spices were brought from China and Sumatra and across the Bay of Bengal to Ceylon where the Arabian ships carried the merchandise to the Middle Eastern markets. And as on the eastern seas, Arab navigation was at home so it was on the Mediterranean. They linked India, China, Ceylon and the East Indies with the Middle East and with Europe in one vast network of trade.[17] Hence, they had a monopoly on Spice Trade in eastern waters and through Alexandria and Constantinople, Venetian merchants carried it to Europe.

In North Africa, Tunis became the new center of consolidation of commerce between the East and Spain as it also extended its trade into the interior of Africa without any competition.

In the Iberian Peninsula, economy bloomed especially in its golden age under Abd al-Rahman III and his son. The internal revenue from taxation (algibayah) reached a record high of 5,480,000 Dinars a year.[18]

In general, in both, the Eastern and the Western Caliphates during this period, the Arabs excelled their rivals in skill and order in the art of trade. Their commercial relations, extended to almost all known countries then, and the use and knowledge of oriental spices and aromatics was greatly fostered by them as well as the practice of medical application thereof. Islam encouraged the spirit of enterprise and the founding of Islamic colonies as emporiums for trade. Their

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ships kept an equally lively traffic with the ports of Ceylon (Sarandeeb, in Arabic) and with the West Coast of India in the East and with the African Coast and the Island of Madagascar (wag wag) south of their homeland.

Worth and Uses of Spices and Drug Plants

These products being valued greatly, their trade, thus, played a great role in the economic and cultural life of many societies. Pepper, for example, was one of the most esteemed and important of all spices and the symbol of price trade and a medium of exchange when money was scarce. In a sense it promoted international commercial activities and was priced like silver and gold. Duties, rent, taxes, customs and ransoms were paid in pepper[19]. Cardamom was described by al-Idrisi and other pharmacists in the Middle Ages. The same could be said of fennel. Gum arabic known from the most remote records of history was used by the Arabian physicians during the Middle Ages. The therapeutic use of mastic grains was known also. Ginger, growing in Arabia, found use in the form of confection in the apothecary's shop. Saffron was highly prized since antiquity as a medicine, a condiment, a perfume and a dye. It played an important part in the commercial list of medieval times[20].

Scientific Study and Application

Out of these fragrant products, from their oils, gums and resins, the apothecaries, ever since ancient times, made anointing oils, burnt offerings, sweet perfumes and medicinal preparations. Later, the Arabians used these extensively in compounding drugs and in pharmaceutical processes which elevated the art of healing. They established botanical gardens in Baghdad and other cities and introduced the cultivation of the sugarcane, indigo, citrus, caraway and other plants into the Mediterranean areas. In connection with aromatics, the Arabs fostered and improved greatly the process of distillation in regard to hermetic art.[21] The alembic, in distilling apparatus, is their genuine contribution.

On the other hand, many plants of medicinal value, and spices unknown to the ancients were introduced into medicine and other uses by the Arabs who in turn imported these various items from China, India, East Indies or Persia. Some of these are: camphor (an Arabic word of Persian origin), galanga-root (from the Chinese), benzoin, nutmeg, senna, cubeba, tamarindus, nux vomica, manna, wormseed and sandalwood. The use of the latter item by the apothecaries in the Islamic Empire brought forth the title of Sandalani to the profession. The word is used even today, with little change, to designate the pharmacist's title.[22] Moreover, a good number of these spices and drug plants are still known by their Arabic names.

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The rapid increase in the materia medica and the need for greater skill in the compounding of drugs and pharmaceutical preparations led in late eighth century to the separation of the medical from the pharmaceutical profession.[23] An attempt to stop the adulteration of drugs was made by official adoption (of great historical interest) of the great pharmacopoeia of Sabur Ibn Sahl of the ninth century which was the first of its kind to influence Muslim medicine.[24] This was followed by the official inspection of the drug shops and the preparation of medicines including rose water.[23]

The last chapters of the *Paradise of Wisdom* by al-Tabari *ca.* 850 A.D. are unique because they discuss Indian drugs and their applications.[25] Other botanists wrote books of scientific nature on the subject as that of al-Dinawari "On Plants". Avicenna, himself, dedicated a few chapters in his famous *al-Qanun* to discussing the materia medica of the time. Al-Biruni who died 1050 A.D. wrote a book on the "Knowledge of Drugs" including many spices. In the middle of the twelfth century, al-Ghafiqi who was the greatest expert of his time on simples, wrote a famous work "On Simple Drugs" which contained the best said on drugs plants and was a standard text on the topic.[26] However, the work that stands out as the foremost medieval treatise of its kind is that of al-Baitar of the thirteenth century. Browne called him the great botanist of Malaga, a worthy successor of Dioscorides who travelled widely through Greece, Asia Minor and Egypt in search for medicinal herbs.[27]

Therefore, this period was characteristic in remarkable advancements of drug therapy and the evaluation and use of drug plants and the application of pharmaceutical processes to spices and aromatics. The so called "Galenical chemicals" came into a wide use by the compounding, processing and extracting of these products.

The Decline of Arabian Influence

With the crusades, navigation in the Mediterranean turned gradually to Italian cities as Venice, Genoa and Pisa. These cities were helped considerably as they obtained trading privileges in the conquered lands as a repayment of the aid done to the crusaders. Soon, the Italian cities gained monopoly over trade in the Mediterranean. Towards the end of the thirteenth century, as Baghdad fell into the hands of the Mongols in 1258, it lost its commercial supremacy. This decline spread over all the Arab states as they lost their political power. Boom in economy, supremacy and prestige, rapidly marched to Italy, Christian Spain, Portugal and to many Western countries of Europe, which carried on the spice trade.

Hence, spices and aromatics which constituted the first foundation of international commerce since antiquity and was carried, regulated and advanced by the Arabs have retained their original value in spite of all changes in world's history.[28]

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REFERENCES

1. Gildemeister, E., and Hoffmann, F. *The Volatile Oils*, translated by Kremers, Ed., N.Y. Vol. I, 2nd ed. (1913), pp. 4-5.
2. *Ibid.*
3. Fahmi, I.R. "The Medicinal Plants of the Middle East", in *The Lebanese Pharm. Jr.*, Vol. 4, No. 1, (1956), pp. 14-15.
4. Parry, J.W. *The Story of Spices*, N.Y. (1953), pp. 10-12.
5. Exodus XXX:23-25.
6. Naves, Y.R., and Mazuyer, G. *Natural Perfume Materials*, N.Y. (1947), pp. 6-7.
7. Parry, J.W. *The Story of Spices*, pp. 30-32.
8. Hitti, Philip K. *History of the Arabs*, London, 1937, pp. 52-6.
9. Parry, J.W. *The Story of Spices*, pp. 34-5, 50.
10. Fahmi, I.R. *The Medicinal Plants of the Middle East*, p. 16.
11. Sagarin, Edward. *The Science and Art of Perfumery*, N.Y. 2nd ed., (1954), pp. 9-10.
12. Artz, F.B. *The Mind of The Middle Ages*, 2nd ed., N.Y., (1954), p. 133.
13. *Ibid.*, pp. 143, 148.
14. Gildemeister and Hoffmann. *The Volatile Oils*, pp. 9-10.
15. Skinner, F.G. "European Weights and Measures" in *Acte du Vie Congrés Inter. d'Hist. des Scs.*, 1950, vi, pp. 237-7.
16. Kramers, J.H. *The Legacy of Islam*, by Arnold, T., 1st ed., 1925, p. 100.
17. Chambliss, Rollin. *Social Thought*, N.Y., (1954), pp. 284-5.
18. Belot, J. and Rodet, A. *Nuchabu al-Mulah*, pt. 1, Vol. 3, Beirut, 1892, pp. 20-28.
19. Xavier, Sister Mary Francis. *Statutes of the Guilds of Phys. Apoth. and Merch. in Florence 1313-16*, Doctoral Thesis, 1935, U. of Wis., p. 242.
20. *Ibid.*, p. 198.
21. Gildemeister and Hoffmann. *The Volatile Oils*, 1913, p. 21.
22. Meyer, E.H.F. *Geshichte der Botanik*, 3rd ed., Vol. 3, Konigsberg, 1856, pp. 121-3.
23. Elgood, Cyril. *A Medical History of Persia*, Oxford, 1951, pp. 272, 275.
24. Sarton, G. *Introduction to the History of Science*, Vol. I, Baltimore, p. 608.
25. Leclerc, L. *Hist. de la Méd. Arabe*, Paris, 1876, Vol. I, pp. 202-3.
26. Ibn Abi Usaibieh. *Uyun al-Anba Fi Tabakat al-Atibba*, Cairo 1884, Vol. 2, p. 53.
27. Browne, E.G. *Arabian Medicine*, Cambridge, U. Press, 1921, pp. 97-8.
28. Gildemeister and Hoffmann. *The Volatile Oils*, 1913, pp. 12-13.

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BIBLIOGRAPHY

1. Artz, F.B. *The Mind of the Middle Ages*, 2nd ed., Al. A. Knopf, New York, 1954.
2. Belot, J. and Rodet, A. *Nuchabu al-Mulah*, pt. I, Vol. 3, Cath. Press, Beirut, 1892.
3. Browne, E.G. *Arabian Medicine*, Cambridge, U. Press, 1921.
4. Chambliss, Rollin. *Social Thought*, N.Y., 1954, The Dryden Press.
5. Elgood, Cyril. *A Medical History of Persia*, Oxford, 1951.
6. Fahmi, I.R. "The Medicinal Plants of the Middle East", in *The Lebanese Pharm. Jr.*, Vol. 4, No. I, 1956, pp. 14-16.
7. Gildemeister, E., and Hoffmann, F. *The Volatile Oils*, translated by Kremers, Ed., N.Y., 2nd ed., (1913).
8. Hitti, Philip K. *History of the Arabs*, Macmillan and Co., London, 1st ed., (1937).
9. *Holy Bible*, King James Version.
10. Ibn Abi Usaibieh, *Uyun al-Anba fi Tabakat al-Atibba*, ed. by M. Muller, Cairo, 1884.
11. Kramers, J.H. "Geography of the Arabs", in *The Legacy of Islam*, by Arnold, T., 1st ed., 1925.
12. Leclerc, L. *Histoire de La medicine Arabe*, Paris, 1876, Vol. I.
13. Meyer, E.H.F. *Geschichte der Botanik*, 3rd ed., Vol. 3, Konigsberg, 1856.
14. Naves, Y.R. and Mazuyer, G. *Natural Perfume Materials*, N.Y., 1947.
15. Parry, J.W. *The Story of Spices*, N.Y., 1953.
16. Sagarin, Edward. *The Science and Art of Perfumery*, 2nd ed., N.Y., 1954.
17. Sarton, G. *Introduction to the History of Science*, Baltimore, Vol. I, 1927.
18. Skinner, F.G. "European Weights and Measures", in *Acte du Vie Congrés International d'Histoire des Sciences*, vi. 1950, pp. 236-7.
19. Xavier, Sister Mary Francis. *Statutes of the Guild of The Physicians, Apothecaries and Merchants in Florence ,1313-16 A.D.*
20. Meyerhof, M. "Arabian Pharmacology", in *Ciba Symposia*, Vol. 6, Nos. 5 and 6, 1944, p. 1852.

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THE EFFECT OF CULTURAL AND CLIMATIC VARIABLES ON THE COMPOSITION AND FORMATION OF ESSENTIAL OILS IN THE PLANTS

RAFI AHMAD, TASNEEM ULLAH SHEIKH, ASHFAQ AHMAD AND MUSHTAQ AHMAD

The geographical features of a country especially its location with reference to latitude, high mountains, oceans, land formations, altitude, inland rivers and lakes govern incidence of local temperature, rainfall and duration of seasons. They have a profound effect not only on the vegetation but also on the chemical composition and yield of essential oils from the crops. A great deal of work has been done in the past to study the effect of culture and environmental conditions on the essential oil composition and formation in the plant and has been found that there is no common interpretation of the effect of a given environmental factor, such as light, temperature, moisture, nutrition on the yield of essential oil in the plants. The responses of the different plants to the same factors were found to be varied. Hornok[1] investigated the effect of factors such as sowing time, cultivation, temperature, sunlight, water, NPK fertilizers and growth stage at harvest time on the yields of essential oils of peppermint (*Mentha piperita*), sweet basil (*Ocimum basilicum*), coriander (*Coriandrum sativum*), dill (*Anethum graveolens*), tarragon (*Artemisia dracunculus*) and fennel (*Foeniculum vulgare*) and reported that the effect of the same factor on the yield of essential oil in different plants was not the same but was different in different plants. It is difficult to draw any theoretical conclusion as to the physiological effects of climate, soil and other variables on the composition and formation of essential oils in the plants. The studies based on the results of recent research from the literature would give an overall picture of the state of oil in plants under different cultural and climatic conditions. Such an undertaking would certainly be of great importance from the commercial and agricultural point of view. This will not only help the grower to exploit the experience of the previous workers in the cultivation of the oil bearing crops on a systematic and organised footing but will also cater an extent of the local growing demand of the essential oils and will bring a handsome return to the growers.

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Different climatic factors

The effect of climatic factors such as temperature, rainfall, frost, sunlight, dry and warm weather, based on the results of experiments under rigidly controlled conditions as conducted by various workers are reported to highlight the effects of these factors on the composition and formation of the oils in the various plants. Rabak[2] studied that the conditions of soil and climate were influential factors in the formation of oil and its constituents in the peppermint plant, and reported: light sandy or loamy soils were the most favourable for the production of an oil of the high quality. The yield of the oil from the fresh plant decreased as the plant matured. Drying the plant before distillation resulted in the loss of volatile oil. Most of the oil was found in the leaves and flowering tops; the percentage of the ester in the oil increased as the plants approached maturity and the menthol content of the oil had a close relationship to the ester content. The drying of the plant caused changes favourable to esterification and the production of the free acids, while the percentage of free and total menthol in the oil distilled from the dried plant was also uniformly high. The formation of ester and menthol took place most readily in the leaves and tops of the plants. The effect of shade upon the peppermint plant decreased esterification and formation of menthol and was due possibly to the lessened activity of the elimination of water from the plant. The action of frost on the other hand noticeably increased esterification as well as the formation of menthol. Henry and Mme. Deel[3] investigated that the pH of the soil had great influence on the formation and composition of peppermint oil in English and French varieties of mint and reported that the pH optimum was quite different for the two varieties of mint and was near to 5 and 7 respectively. The yield of the oil per hectare diminished as the pH values of the soil deviated from these respective values. Maffei and Massimo[4] studied the effect of environmental factors influencing the composition of essential oils in 11 mint species, grown at Piedmont (Italy) and recorded that the temperature and rainfall changes affected the oil composition of some species, particularly peppermint. Russel[5] investigated the influence of climatic conditions on the yield and quality of the oil of *Mentha arvensis* plants, variety *piperascens* grown at six different locations and determined the yields of combined and free menthol. However, the altitude, soil types, rainfall, mean temperature etc., were also noted to discover the causes of variations in the composition of essential oil from season to season but the attempt failed to find any plausible cause of these variations. It was believed that the plants grown in the sun gave higher yields of the oil than the others. Duriyaprapan[6] studied the effect of temperature on the yield and quality of essential oils of Japanese mint by growing the plants of the specie under 12 treatments consisting of 4 day and 3 night temperatures and recorded that the different temperature treatments

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did not affect greatly the percentage of menthol, whereas under field conditions maximum yield of the Japanese mint oil occurred during the flowering. However, this close relationship between the oil yield and flowering did not occur under extremes of temperature. Mustyatse[7] reported: the essential oil in the mint plant grown in the dry and warm climate of Moldavia, accumulated in the leaves at the very initial stage of development and did not change with the age of the plant. The essential oil as a rule rose from the lower leaves to the upper ones but the menthol in the oil changed in the opposite direction. In the driest year the irrigation was found to cause an increase of essential oil and a decrease of menthol in the oil. However, at a temperature below 21-4°, the essential oil in the leaves decreased. Vaverkova and Holla[8] recorded the essential oil content and relative amounts of its constituents in the organs of peppermint (*Mentha piperita*) grown at Bratislava and reported that in plants grown for two years in a light sandy loam soil, the content of the oil was maximum at the onset of flowering thereafter it decreased until the stage of biological maturity, the relative contents of the individual components varied in the course of vegetative period with the menthol content increasing during ontogeny of the plant.

Different seasons

There is ample evidence in literature to show that different seasons of the year have profound influence on the composition and formation of essential oils in plants. The temperature and atmospheric moisture content changes which are intimately associated with the seasonal variations, are reported to have great influence on the functioning of enzymes, involved in the formation of essential oils. This may cause differential development of essential oils in plants. However, the results from the experiments conducted by various workers under controlled conditions, are recorded to elaborate the effect of different seasons on oils in plants. Gralla and Picci[9] studied the seasonal variation in essential oil of *Salvia officinalis,* and reported: the essential oil yield from *Salvia officinalis* was greatest in July-August (2.5%) and least in February (1.0%). From July to March the oil was especially rich in α-pinene, camphene, α- and ß-thujone, camphor and borneol, whereas, in the spring (March-June) there was an increase in the 1, 8-cineole, bornyl acetate, ß-pinene and α-humulene. Oils of superior quality were obtained in July or October, when thujone accounted for 14 to 20% respectively of the oil. As a result of seasonal variations Laskar and Ghosh[10] determined eugenol, methyl eugenol and caryophyllene to be the major constituents in the essential oil from leaves of *Ocimum sanctum* from July to May. Cabo *et al.,*[11] studied the effect of seasonal variations on the yield and

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composition of essential oil of *Thymus hyemalis* throughout its complete vegetative cycle and recorded that the yield and composition of the oil changed from month to month. July was reported as the most suitable month for harvesting *Thymus hyemalis* giving maximum yield of the oil, especially rich in terpenic hydrocarbons but maximum amount of 1, 8-cineole found in August also justified its harvest during this month as well. Rizk *et al.*,[12] studied the effect of seasonal variations on the volatile oil of *Cymbopogon parkeri* growing in Qatar and reported that essential oil content was higher during the hot dry season than during the humid hot season and the cold season, there were no qualitative difference among the monthly collected samples but the quantity of the individual compounds varied greatly. Putievsky *et al.*,[13] investigated the influence of season and harvest frequency on the essential oil yields from a pure clone of sage (*Salvia officinalis*) grown under cultivated conditions, and recorded: the highest content of the oil (2%) was obtained in the summer whereas it was lower in fall (1.5%) and lowest in spring (0.7%). The amount of α and ß-thujone in the oil increased during the season from 8% in April to 40% in December, whereas borneol decreased from 25 to 5%. Amount of camphor rose in spring from 10 to 25%. However, eucalyptol and α- and ß-pinene showed relatively minor seasonal changes. Thus, under these cultural conditions 2 high-quality and high-yielding harvests per year could be made in July and in October-November. Holeman *et al.*,[14] made comparative chemical study on the essential oils from *Salvia officinalis, S. aucheri, S. verbenaca, S. phlomoides* and *S. argentea,* and reported: α-pinene, 1, 8-cineole, camphor and borneol were identified in all the species. The behaviour of *S. phlomoides* was opposite to that of *S. officinalis.* The yield of the ketones from the oil from the latter specie increased in winter and decreased in the flowering season; there was also a large difference in the ß-thujone component. *Salvia aucheri* constituted an interesting source of camphor (44.1%) and the yield of the oil was 0.8%. Fujita and Morishita[15] studied the seasonal variations in the oil of *Schizonepeta tenuifolia* and reported that during the growing season (-) – pulegone content decreased from 77.3 to 21.2% and (+) – menthone content increased from 11.1 to 61.5%. According to Sinha and Singh[16] the K-deficiency in Japanese mint during winter and rainy season resulted in marked increase in essential oil content. However, the total oil production was low. In general during the rainy season plants had higher percentage of essential oil and total oil per plant. Investigations of Oliveros and Aureus[17] showed that in *Cymbopogon citratus* growing in Philippines, the leaves that were collected during the hot season gave the highest amount of oil (0.3-0.48%). The amount of citral was recorded to be 31.05-45.21% as compared to 25-39.14% obtained during the cool season. Chobinidze and Molodinashvili[18] studied the seasonal dynamics of qualitative content of essential oils in *Ambrosia*

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artemisaefolia growing in different parts of Georgia and reported that the maximum contents of essential oils in plants from Lagodekhi and Zestaponi as noted in later part of August were (0.15 and 0.09% respectively). However, plant in Tbilisi and Marneuli produced 0-12 and 0-13% essential oil respectively in the first of September. As a result of investigations extending over several years, Rabak[19] found: the yield of essential oil in the spearmint was affected by seasonal conditions — being distinctly higher in some seasons than in others. The maximum content of oil appeared to be present during the flowering period with the tops containing the highest percentage of oil. Drying of the plant or plant parts resulted in a lower yield of oil and caused changes producing increased ester and alcohol content. Esterification and alcohol formation tended to increase as the plant reached maturity. Freezing of the plant produced a marked increase in the formation of the odour bearing esters and alcohols. Olszewski *et al.*,[20] studied the essential oil of a mint (*Mentha crispa*) during different vegetation seasons, and reported that the concentration of phellandrene, pinene and of one unidentified compound of the essential oil during the mint flowering, while those of corvone and eucalyptol increased after the end of flowering stage. The concentration of essential oil was found highest in both fresh and dry mint, harvested at flower bud formation.

Different growth stages

Holm *et al.*,[21] studied variation of main terpenes in dragonhead (*Dracocephalum moldavicum*) during growth, and found that the essential oil reached its maximum level during flowering, wherein the geranyl acetate, geranial and geraniol were maximum but neral content, however, decreased during flowering. These studies also indicated that the biosynthesis of geranyl acetate was dominant at the beginning of the vegetative period but was superseded by biosynthesis of geranial and geraniol from the early stage of flowering. Thus, the optimal harvest time was during the flowering stage when the oil content was highest. Putievsky *et al.*,[22] investigated the phenological and seasonal influences on essential oil of a clone of origanum, and reported: the yield and composition of an oil from cultivated clones of *Origanum vulgare* were affected by flowering and seasonal changes. Flowering doubled the oil content, while in non-flowering plants the highest level of the oil was obtained in June. The proportions of thymol and γ-terpinene in the oil varied depending on the season and flowering stage. An increase in the content of one compound was accompanied by a decrease in the other one and vice versa. However, the contents of p-cymene and carvacrol were almost constant during the year independently of flowering. Kekelidze *et al.*,[23] investigated: the essential oils in lemon peel increased during the fruit growth and ripening and reached maximum at full ripeness.

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The foliar essential oils increased from flowering to September, decreased in October, in the initial period of fruit ripening and increased again at full ripeness. During winter the foliar oil content was constant. Foliar limonene increased from flowering to September, whereas α-terpineol, isopulegol, neral and geraniol decreased. In September the foliar limonene content decreased and then again increased during fruit ripening. Limonene also increased in the fruit peel during ripening, whereas linalool, α-terpineol and thymol decreased. Sangwan *et al.*,[24] studied that the level of essential oil of 5 successive harvestings in *Cymbopogon martini,* and reported: the crop contained 0.24-0.56% essential oil at different harvestings. However, the essential oil content was higher at the initiation of flowering than at the vegetative stage or at the bloom period with most flowers open. The flowers contained higher levels of essential oil than leaves while the stem contained only traces. The level of essential oil increased upto the 6th day after harvesting and then decreased when aged in the laboratory, but increased upto the 4th to 5th day and then remained almost constant when aged in the field. Oleshko *et al.*,[25] investigated that the essential oil content of aerial parts of the pineapple weed increased during the growth season with a maximum in flower clusters at the beginning of the flowering and in total aerial biomass at full blossoming. Chobanu[26] reported that essential oil content of *Mentha longifolia* varied from 1.1. to 1.5% with the highest content observed during full blossoming. However, no qualitative changes were noted in oil composition during the growth period. Verzar and Shalaby[27] studied that the essential oil content of *Achillea millefolium collina* plant was more at the budding stage than in the flowering period. However, the oil content was the lowest during the vegetative stage. These studies also revealed the oil percentage in flowers, leaves and stems of the plant to be 0.2, 0.15 and 0.1% respectively, whereas no oil was detected in the roots. Poggendore *et al.*,[28] studied that the essential oil content of 10 dill (*Anethum graveolens*) forms grown in winter in greenhouses was 10-40% of the oil content of field grown summer plants. However, in all forms, highest oil contents were recorded at the green fruit stage of the 2nd seeding (1.45-2.37%), while in the first seeding some forms had the highest oil content during the flowering and some during the green fruit stage, but in winter grown dill, the oil content was recorded to be low. Gora *et al.*,[29] investigated that the essential oil content as well as the chemical composition of *Mentha spicata* was dependent on the phase of its development. However, a maximum level of 1.14% essential oil was observed during the beginning of flowering stage with dihydrocarvone as the major component of the oil which constituted 87% of the oil at the early stage of plant growth and 55% at the flowering stage. Tunmann[30] stated that the younger leaves of labiatae species contained the most oil and the oil was rich in alcohols. Since the terpenes were formed later by the splitting of water.

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Different sites

Lemberg[31] studied Jasmines of different geographical origins and reported that the quantity of *cis*-3-hexenyl acetate (I) in Algerian and French Jasmines was approximately equal to the amount of methylheptenone (II), while in Egyptian Jasmine (I) was in greater amount than (II) and in Italian (I) content was 1/2 that of (II). However, Algerian, French and Egyptian Jasmine contained approximately 3 times as much as *cis* linalool oxide as trans linalool oxide but Italian Jasmine contained equal amounts of each isomer, Verzar *et al.*,[32] described the influence of various localities and soil types on the linalyl acetate and total ester content, specific gravity, colour and optical rotation of the volatile oil fraction of the *Salvia sclarea*. Tetenyi *et al.*,[33] reported that the flowering shoots of *Ocimum suave* collected from different parts of Rwanda showed marked variation in essential oil content and composition of the oil. Dai *et al.*,[34] made comparative study of the chemical constituents of essential oils obtained by steam distillation from the leaves and branches of *Murraya tetramera* growing at various localities such as Yimen, Tongha, and Jianshui in Yunnan provinces and recorded: by GC-MS, altogether 27 chemical constituents were isolated and identified. Of these constituents 21 were isolated and identified from the oil of *M. tetramera* growing in Yimen, their content accounting for 99.69% of the essential oil; 18 constituents were isolated and identified from the oil of *M. tetramera* growing in Tongha, their content accounting for 99.44% of the essential oil; 20 constituents were isolated and identified from the oil of *M.tetramera* growing in Jianshui, accounting for 99.72% of the essential oil. Of these 27 constituents all except caryophyllene were monoterpenes or their oxyderivatives. Zivanovic *et al.*,[35] reported that flowering *Satureja kitaibelii* from 4 sites contained from 0.25-0.65% oil. However, bicyclic sesquiterpenes prevailed in the oil from one site, containing 18% caryophyllene, whereas, aromatic hydrocarbons prevailed in the oil from other site (47% p-cymol) and aliphatic monoterpenes in the oil from the 3rd site (34% geraniol, 25% geranyl acetate). Green and Espinosa[36] studied that allspice (*Pimenta dioica*) of Jamaica, Dominica and Grenada was distinguishable from Central American allspice on the basis of its smaller size and its stronger and smoother flavour. These studies also indicated that Guatemalan, Belizean, Mexican allspice were characterised by a relatively high abundance of monoterpene hydrocarbons, notably myrcene in their essential oil, which accounted for their comparatively harsh aroma and flavour. However, leaf oil compositions closely reflected the main features of the allspice oil and might be employed as a rapid, preliminary method of distinguishing Jamaican and Central American tree types.

Plant breeding

Bos *et al.*,[37] studied the variations in the essential oil content

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and composition in individual plants obtained after breeding experiments with a *Valeriana officinalis* strain and reported that an improvement of oil content was obtained by pollination of a clone rich in essential oil. These studies also indicated that both essential oil content and compounds differed greatly from plant to plant with amounts of compounds varying, e.g., valerenal 24.6-120 and valeranone 7.2-152.0 mg/100 gm. These compounds had sedative and spasmolytic properties. Sharma *et al.*,[38] evaluated a set of 8 elite lemongrasses clones emanating from open pollinated progenies of a local cultivar for oil and citral biosynthesis in 14 samples which include 3 major harvests. Genotype x, environmental interaction and stability parameters were evaluated. The influence of environment was considerably larger than that of a genotype on both oil and citral contents, with the time of harvest having a major effect. However, both characters were poorly to moderately heritable (oil, 9.6; citral 20.5%), hence selection for these traits was difficult.

Plant spacing

There is a considerable difference of opinion with respect to spacing of plants as it is subject to variation according to local conditions. Several factors govern the spacing of oil bearing plants in order to get the maximum yield of the oil viz., size of the plant, cultural conditions and availability of water supply. Rao *et al.*,[39] suggested that plant spacing 30x30 and 45x30 and application of 240 Kg N/ha/yr resulted in high essential oil yield of palmarosa. Randhawa *et al.*,[40] advised that in order to get higher herb and oil yields from *Mentha spicata* crops, the crop should be spaced at 30 cm between the rows and supplied with 100 Kg N/ha. Rao *et al.*,[41] reported that the essential oil yields of bergamot mint were higher with 45 cm row spacing than with 30 cm or 60 cm row spacing. These studies also indicated that 75 Kg N/ha applied in 2 equal parts, half at planting and half at the first harvest recorded maximum biomass and essential oil yield. However, essential concentration was not affected either by row spacing or by N application.

Photoperiod variations

Duriyaprapan and Britten[42] studied the effect of photoperiod on flowering and oil production in Japanese mint under controlled environmental conditions and recorded that vegetative cuttings of Japanese mint, when exposed to 8-, 9-, 10-, 11-, 12- hours photoperiods, showed increased leaf and stem growth, flowering and oil yield with increasing photoperiod. Sacco[43] compared the essential oils from the long day plant *Mentha piperita* variety *officinalis* grown at 45° north (in Italy), at 22° south (in Brazil) 12h/12h photoperiod, and reported that the major components in Brazilian oil were menthol 29.64,

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menthofuran 19.84, menthyl acetate 16.07 and monthane 11.80%, whereas, Italian oil included menthol 45.80, menthone 24.10 and 1, 8-cineole 6.20%. Thus, photoperiod and associated environmental variables apparently had a considerable influence on terpene composition in the specie.

Fertilizer

Owing to their contents of nutrients, the fertilizers and micronutrients are very important to meet the requirements of the crops for their healthy growth and essential oil production. Gustav Mossler[44] studied the effect of various cultural conditions on the ethereal oil content of *Mentha piperita* and reported that the greatest yield of the oil securing greatest monetary return, was obtained by the use of stable manure and K_20, P_20_5, and N., but the addition of superphosphate or Na $N0_3$ to manure did not increase the yield of the oil. However, the finest smelling oil was obtained from the plants growing in the untreated fields. Singh *et al.*,[45] investigated that a combination of 100 Kg N and 60 Kg P_20_5/ha produced maximum oil yields without any marked alteration in the quality of the oil from *Mentha citrata* species grown under experimental conditions. However, a combination of 50 Kg N and 60 Kg P_20_5/ha proved beneficial in increasing linalool content of the essential oil. Kordana *et al.*,[46] recorded that maximum essential oil yield was obtained from the *Carum carvi* seeds raised from the crop treated with the highest fertilizer application comprising of N-P-K. Dey and Choudhuri[47] studied different combinations of fertilizers to increase the yield of oil and eugenol content in *Ocimum sanctum* and recorded that fertilizer treatment constituting N 100 + P 25 + 30 Kg/ha was most effective in increasing the yield of essential oil and eugenol by 28.61 and 28.44% over the control respectively. Mustyatse *et al.*,[48] studied that variety V-24 of clary sage produced highest yield of flower clusters and essential oil when fertilizers N 90 + P 90 Kg/ha were applied during the first year of growth and N 30 + P 30 Kg/ha in the second one. Maidebura *et al.*,[49] reported that the individual components in the essential oil of apples were dependent on the doses of the applied N and K fertilizers. Al-Badawy and Abdullah[50] investigated that the influence of different levels of fertilization (N.P.K.) and growth regulator treatments caused early flowering in yarrow plants, increased significantly the oil percentage at different cuts and total yield of the volatile oil. Salukvadze and Kharebava[51] studied the effect of P fertilizer on the composition of essential oil of black tea and reported that P fertilization decreased the level of theospirone but increased the level of dihydroactinidiolide (these two compounds are the main contributors to black tea aroma) and caused also the other differences in the essential oil composition. Thomas *et al.*,[52] reported that in a 3 year experiment, maximum oil yield with high eugenol content was obtained

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with two harvests of *Cinnamomum zeylanicum* leaves per year, in May and November. P application (180 g/tree/yr) increased oil yield and recovery in a two year experiment. Foliar application of urea at fortnightly intervals in October and November did not significantly increase oil yield and recovery, although the 4% urea rate gave 28% increase in oil recovery over the control.

Micronutrients

Nandi and Chatterjee[53] studied the essential oil formation was stimulated in *Ocimum gratissimum* by the micronutrients viz., Zn, Mo and B, but to the greatest extent by B. In the case of *Mentha arvensis*, low concentrations of Zn and Mo increased essential oil formation whereas B was most effective at high concentrations. Choudhury *et al.*,[54] studied that in *Ocimum gratissimum* the foliar application of Zn at 50 ppm increased essential content to 0.64% and while with 25 ppm Mo highest percentage of eugenol (72.8%) was obtained.

Growth regulators

Growth regulators play a dominating and often a controlling role in regulating all the metabolic processes during different stages of plant development right from the seed germination up to the formation of fruits, seeds. The production of essential oils in the plants is directly or indirectly controlled or promoted by the plant growth regulators. Lliev *et al.*,[55] studied the influence of growth regulators on the growth and yield of mint oil and observed that the treatment of root stocks with kinetin (2 and 10 ppm) and indoleacetic acid 50 ppm resulted in an increase in the number of plants/M in the varieties toundja and *Mentha piperita*. The content of essential oil was also increased in both the varieties by both compounds. Porter and Shaw[56] reported that spraying of immature plants of *Lavandula angustifolia* with atrinal and P 293 doubled the amount of essential oil per plant without any alteration in the oil composition. Al-Badawy and Abdullah[50] recorded that spraying of growth regulators, atrinal, BL-2511 and RSW 0411 at different concentrations on yarrow plants increased significantly the total dryweight of the flowering tops, the oil percentage at different cuts and total yield of the volatile oil. Abad and Sherma[57] studied the effect of growth retardants, chlormequat chloride on the growth and essential oil content of Japanese mint and recorded that chlormequal chloride increased significantly the oil content and inhibited the growth of the mint plant to some extent whilst ethephon at 0.06% concentration significantly decreased the plant growth but had no significant effect on the essential oil content.

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Herbicides

The presence of weeds consume a large amount of plant nutrients and through transportation lead to very heavy losses of soil moisture. Destruction of weeds by the application of herbicides have been recorded to enhance the essential oil production from oil bearing crops. Pank *et al.*,[58] studied the effect of different herbicides on the content and composition of essential oil when applied to caraway in the year of planting and recorded that elbanil, probanil, uron, trizilin and maloran gave good weed control, chloral in combination with prometryen, propyzamide and alloxydim sodium slightly increased the essential oil content in the seeds and the carvone content in the essential oil. Wall and Friesen[59] studied that the herbicide treatment of *Anethum graveolens* crop increased fresh weight yield as well as the essential oil content of the crop, followed by the weed control obtained. Whereas at high levels of weed competition carvone decreased and α-phellandrene content of the essential oil of the specie was noted to be increased. Choushev and Dzhurmanska[60] investigated that the application of 1-6 Kg sinbar/ha controlled the weeds and increased the yield of essential oils from 2 mint cultivars, did not affect it in the 3rd cultivar and decreased in the 4th cultivar. Terbutrex at 2 Kg/ha was slightly toxic for 1 cultivar, slightly increased the yield of another cultivar and did not affect the yield of 2 cultivars. Two other herbicides were found toxic to all cultivars.

γ-Irradiation

Srivastava and Tyagi[61] studied the effect of seed irradiation on yield and quality of essential oil by subjecting dry seeds of palmarosa to 12 doses of γ-rays ranging from 12-100 KR and observed that at 10 and 15 KR doses, the yield and quality of the oil were enhanced. The results of high yield and quality of the oil as induced by γ-Irradiation were discussed from the point of view that a gene might have been altered by mutagen treatment to produce a metabolic block between geraniol and geranyl acetate on the biosynthesis path or that modifier genes controlling the expression of a key precursor molecule might have been further modified to give rise to a geraniol rich chemotype in palmarosa. Chosdu and Hilmy[62] recorded the effect of γ-Irradiation on the essential oil content of medicinal plants and species and found that the characteristics and contents of essential oils of *Curcuma xanthorrhiza, Curcuma aeruginosa, Curcuma domestica* and *Kaempferia galanga* did not change by irradiation.

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REFERENCES

1. Hornok, L. Dev. Food Sci., 18 (1988), *Chemical Abstract*, 109, 167502, (1988).
2. Rabak, F. Bur. Plant Industry, *U.S. Dept. Agri. Bull.*, 454, *Chemical Abstract*, 11, 1517-7, (1917).
3. Henry Deel and Mme. Henry Deel. *Bull. of Soc. Chim.*, 37, 453-5, (1925), *Chemical Abstract*, 19, 1927-8, (1925).
4. Maffei, Massimo. *Flavour Fragrance J.*, 3(2), 79-84, (1988); *Chemical Abstract*, 109, 226738, (1988).
5. Russell, G.A. *J. Am. Pharm. Assoc.*, 14, 679-81, (1925), *Chemical Abstract*, 20, 1691-7, (1926).
6. Duriyaprapan, Soonthorn; Britten, E.J. and Basford, K.E. *Ann. Bot.* (London), 58(5), 729-36, (1986), *Chemical Abstract*, 106, 15864, (1987).
7. Mustyatse, G.I. *Polezn. Svoistva Dikorastushchikkh Rast. Mold.*, 79-85, (1973), (USSR), *Chemical Abstract*, 84, 2313, (1976).
8. Vaverkova, Stefania and Holla, Magdalena. *Biologia* (Bratislava), 41(5), 471-6, (1986), *Chemical Abstract*, 105, 58045, (1986).
9. Gralla, G.E. and Picci, V. *Fitoterapia*, 59(2), 97-102, (1988), (Italy), *Chemical Abstract*, 109, 187362, (1988).
10. Laskar, S. and Majumdar, S. Ghosh. *J. Indian Chem. Soc.*, 65(4), 301-2, (1988), *Chemical Abstract*, 109, 51762, (1988).
11. Cabo, J.; Crespo, M.E.; Jiminez, J.; Navarro, C. and Risco, S. *Planta Med.*, 53(4), 380-2, (1987), *Chemical Abstract*, 107, 172499, (1987).
12. Rizk, A.M.; Heiba, H.I.; Mashaly, M. and Sandra, P. *Qatar Univ. Sci. Bull.*, 5, 71-6 (1985), *Chemical Abstract*, 106, 2908, (1987).
13. Putievsky, Eli; Ravid, Uzi and Dudai, Nativ. *J. Nat. Prod.*, 49(2), 326-9, (1986), *Chemical Abstract*, 104, 222022, (1986).
14. Holeman, M.; Berrada, M.; Bellakhdar, J.; Llidrissi, A. and Pinel, R. *Fitoterapia*, 55(3), 143-8, (1984), *Chemical Abstract*, 102, 119401, (1985).
15. Fujita, Shinichi and Morishita, Tokue. *Yakugaku Zasshi*, 107(12), 959-63, (1987), *C.A.*, 108, 173345, (1988).
16. Sinha, N.C. and Singh, J.N. *Plant Soil*, 79(1), 51-9, (1984), *C.A.*, 101, 53992, (1984).
17. Oliveros-Belardo, Luz and Aureus, Elsie. *Asian J. Pharm.*, 3(4), 14-17, (1978), *C.A.*, 90, 156981, (1979).
18. Chubinidze, V.V. and Molodinashvili, S.Z. *Soobshch Akad. Nauk Gruz.* SSR, 111(3), 625-7, (1983), *C.A.*, 100, 48605, (1984).
19. Rabak, F. *J. Ind. Eng. Chem.*, 10, 275-9, (1918), *C.A.*, 12, 974-6, (1918).
20. Olszewski, Zenon; Pluta, Janusz and Szymczak, Jan. *Herba Pol.*, 20(3), 247-52, (1974), *C.A.*, 83, 103120, (1975).
21. Holm, Yvonne; Galambosi, Bertalan and Hiltunen, Raimo. *Flavour Fragrance J.*, 3(3), 113-15, (1988), *C.A.*, 110, 72525, (1989).
22. Putievsky, E.; Ravid, U. and Dudai, N. *J. Sci. Food Agric.* 43(3), 225-8, (1988), *C.A.*, 108, 192584, (1988).

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CC-O. In Public Domain. Digitized by eGangotri Trust

23. Kekelidze, N.A.; Dzhanikashvili, M.I.; Rusdaze, L.V. and Kachurina, A.P. *Khim. Prir Soedin.*, (6), 784-7, (1985), *C.A.*, 104, 165371, (1986).

24. Sangwan, N.K.; Dhindsa, K.S.; Malik, O.P.; Sharma, G.D. and Paroda, R.S. *Haryana Agric. Univ. J. Res.*, 15(1), 21-5, (1985), *C.A.*, 103, 211335, (1985).

25. Oleshko, G.I.; Syuzeva, Z.F.; Melnikova, O.A. and Evtikheeva, O.V. *Farmatsiya*, 33(4), 28-30, (1984), *C.A.*, 101, 147848, (1984).

26. Chobanu, V.I. *Fiziol. Biokhim. Rast. Mold. Mater. Resp. Konf. Fiziol. Biokhim.*, 2nd, 269-71, (1976), *C.A.*, 90, 183270, (1979).

27. Verzar-Petri, G. and Shalaby, A.S. *Acta Agronacad Sci. Hung.*, 26(3-4), 337-42, (1977), *C.A.*, 88, 65858, (1978).

28. Poggendore, A.; Goeckeritz, D. and Pohloudek-Fabini, R. *Pharmazine*, 32(10), 607-13, (1977), *C.A.*, 88, 86130, (1978).

29. Gora, Jozef; Druri, Marek; Kaminska, Janina and Kalemba, Danuta. *Herba Pol.*, 21(4), 357-65, (1975), *C.A.*, 85, 68121, (1976).

30. Tunmann. *Pharm. Ztg.*, 52, 353, *C.A.*, 1, (1878), (1907).

31. Lemberg, Seymour. Int. Congr. Essent. Oils, (PAP), 6th, 91, 8 pp, (1974), *C.A.*, 84, 35189, (1976).

32. Verzar-Petri, G.; Then M. and Meszaros, S. *Essent. Oils Aromat. Plants, Proc. Int. Symp. 15th*, 199-202, (1984), *C.A.*, 103, 220591, (1985).

33. Tetenyi, P.; Ntezerubanza, L.; Ayobangira, F.; Hethelyi, E. and Puyielde, L.V. *Herba Hung.*, 25(2), 27-42, (1986), *C.A.*, 106, 192750, (1987).

34. Dai, Yunhua; Liang, Xiaoyuan; Xu, Li; Cai, Feng; Ding, Jingkai; Yi, Yuanfen and Wu Yu. *Yunnan Zhiwu Yanjiu*, 8(4), 477-81, (1986), *C.A.*, 107, 55756, (1987).

35. Zivanovic, Predrag; Jancic, Radisa; Sevarda, Aleksej, L.; Kuzn' Etsova, G.A.; Pavlovic, Stamenko and Todorovic, Branislava. *Arh. Farm.*, 37(6), 297-308, (1987), *C.A.*, 109, 51767, (1988).

36. Green, Clinton L. and Felix, Espinosa. *Dev. Food Sci.*, 18, (1988), *C.A.*, 109, 188998, (1988).

37. Bos, R.; Van Putten, F.M.S.; Hendriks, H. and Mastenbroek, C. *Prog. Essent. Oil Res., Proc. Int. Symp. Essent. Oils*, 16th (1985), *C.A.*, 105, 102320, (1986).

38. Sharma, J.R.; Naqvi, A.A.; Lal, R.K. and Mishra, H.O. *Genet. Aqrar* 42(1), 13-23, (1988), *C.A.*, 110, 21214, (1989).

39. Rao, E.V.S. Prakasa; Singh, Munnu; Rao, R.S. Ganesha and Rao, B.R. Rajeswara. *J. Agric. Sci.*, 104(1), 67-70, (1985), *C.A.*, 102, 148174, (1985).

40. Randhawa, G.S.; Mahey, R.K.; Sidhu, B.S. and Saini, S.S. *Indian Perfum.*, 28(3-4), 146-9, (1984), *C.A.*, 103, 36682, (1985).

41. Rao, B.R. Rajeswara; Singh, S.P. and Rao, E.V.S. Prakasa. *Indian Perfum.*, 28(3-4), 150-2, (1984), *C.A.*, 103, 36683, (1985).

42. Duriyaprapan, S. and Britten, E.J. *Thai J. Agric. Sci.*, 19(4), 313-20, (1986), *C.A.*, 106, 173169, (1987).

43. Sacco, Tommaso. *Essenze Deriv. Agrum*, 57(3), 535-9, (1987), *C.A.*, 109, 226762, (1988).

44. Gustav, Mossler. *Pharm. Post.* 45, 2-5, *Chemical Abstract*, 6, 2282, (1912).

45. Singh, V.P.; Bhattacharya, A.K.; Singh, A.K.; Singh, Kamla and Singh, J.P. *Indian Perfum.*, 27(1), 24-7, (1983), *Chemical Abstract*, 100, 50542, (1984).

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46. Kordana, S.; Lesniewska, S. and Golez, L. *Herba Pol.*, 29(1), 27-38, (1983), *Chemical Abstract*, 100, 119965, (1984).

47. Dey, B.B.; Choudhuri, M.A. and Pafai J. 6(1), 20-4, (1984), *Chemical Abstract*, 101, 150707, (1984).

48. Mustyatse, G.I.; Roshka, N.D. and Kleshch, F.I., *Makro-Mikroelem. Regul. Obmena Veshchestv Rast.*, 87-92, (1983), (USSR), *Chemical Abstract*, 101, 150732, (1984).

49. Maidebura, V.I.; Udalova, V.I. and Belyak, N.I. *Fiziol. Biokhim Kul't. Rast.* 16(6), 567-72, (1984), (Russ), *Chemical Abstract*, 102, 61412, (1985).

50. Al-Badawy, Ahmed A. and Abdullah, Nadia, M. *Proc. Plant growth Regul. Soc. Am.*, 11th., 37-44, (1984), *Chemical Abstract*, 102, 162094, (1985).

51. Salukvadze, M.M. and Kharebava, L.G. *Subtrop. Kul't.*, (4), 32-7, (1985), (Russ.), *Chemical Abstract*, 104, 33523, (1986).

52. Thomas, J.; Geetha, K. and Shylaraj, K.S. *Indian Perfum.*, 31(3), 249-51, (1987), *Chemical Abstract*, 109, 229489 (1988).

53. Nandi, R.P. and Chatterjee, S.K. *Indian Perfum.* 30(2-3), 321-6, (1986), *Chemical Abstract*, 106, 49199, (1987).

54. Choudhury, S.N.; Hazarika, A.K. and Bordoloi, D.N., *Indian Perfum.*, 30(4), 465-9, (1986), *Chemical Abstract*, 107, 114828, (1987).

55. Lliev, L.; Zlatev, S. and Zlateva, M. *Proc. Int. Symp.*, 2nd., 622-6, (1975), *Chemical Abstract*, 89, 37946, (1978).

56. Porter, N.G. and Shaw, M.L. *J. Plant Growth Regul.*, 2(2), 151-8, (1983), *Chemical Abstract*, 100, 46910, (1984).

57. Abad Farooqi, A.H. and Sherma, Sirikant. *Plant Growth Regul.*, 7(1), 39-45, (1988), *Chemical Abstract*, 109, 18794, (1988).

58. Pank, F.; Marlow, H.; Eichholz, E.; Ennet, D. and Zygmunt, B. *Pharmazie*, 39(12), 838-42, (1984), *Chemical Abstract*, 102, 108122, (1985).

59. Wall, D.A. and Friesen, G.H., *Crop. Prot.* 5(2), 137-42, (1986), *Chemical Abstract*, 104, 202238, (1986).

60. Choushev, G. and Dzhurmanska, S. *Pochvozn. Agrokhim. Rastit. Zasht.*, 21(1), 126-30, (1986), (Bulg), *Chemical Abstract*, 105, 56265, (1986).

61. Srivastava, H.K. and Tyagi, B.R. *Enphytica*, 35(2), 369-80, (1986), *Chemical Abstract*, 105, 148877, (1986).

62. Chosdu, Rahayo; Hilmy, Nazly and Bagiawati, Sri. Maj. *Batan*, 18(2), 37-63, (1985), (Indonesian), *Chemical Abstract*, 105, 38271, (1986).

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APHRODISIAC DRUGS FROM ISHAQ IBN MURAD'S MANUAL

YALÇIN TEKOL

The book was written in 792 A.H./1390 A.D. in an Anatolian town, Gerede. It is accepted as the first Turkish-edited medical book in Anatolia[2]. The present study is based on the Malatya edition, which exists at State Library of Malatya/Turkey (no. 256). To find the Latin and English equivalents of Turkish drug names, Baytop 1984[1], Tuncer 1978[5] and New Redhouse Turkish-English Dictionary 1979[3] were consulted.

Ishaq ibn Murad's* manual contains two main chapters. The first chapter can be identified as materia medica. It contains the Turkish names of the drugs in alphabetical order and gives Persian and Arabic equivalents. The second chapter deals with illnesses and their therapy. At the end of the book a glossary is given, which includes the Turkish, Persian and Arabic equivalents of medical terms. The book has been found to be a valuable source also for linguistic studies[4].

Table I represents the aphrodisiac drugs mentioned in the book. The author emphasizes also the importance of foodstuffs for sexual function. For increasing sperm production, he recommends especially chick-pea. The alternatives are (1) broad bean with longpepper and/or ginger, (2) onion cooked with mutton. For exciting sexual desire, egg-yolk, bone-marrow and sparrow brain is advised. He points out that chick-pea and wheat-grain cooked with mutton can be used also for this purpose.

TABLE I

Aphrodisiac drugs from Ishaq ibn Murad's manual

Turkish	Latin**	English
Yilan boncugu	*Arum* sp.	Arum[2]
Anisun	*Pimpinella anisum* L.	Aniseed[1, 2]
Bal		Honey[2]
Besbase	*Myristica fragrans* Houtten	Mace[2]

* Ishaq ibn Murad was a Turkish physician who lived in Gerede in Anatolia. His chief work is *Kitab Edviye-i-mufride* written in Turkish. He completed this in 1390 A.D.

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Turkish	Latin**	English
Bugday	*Triticum aestivum* L.	Wheat[1]
Beladir bali	*Semecarpus anacardium* L.	Marking nut juice[2, 4]
Baldirikara	*Adiantum capillus-veneris* L.	Venus hair[1]
Puy	*Trigonella foenum-graecum* L.	Fenugreek seed[2]
Turb	*Raphanus sativus* L.	Radish[3]
Hardal	*Sinapis* sp.	Mustard[3]
Hurma	*Phoenix dactylifera* L.	Date[2, 3]
Hashas	*Papaver somniferum* L.	Opium poppy[3]
Darifülfül	*Piper longum* L.	Long pepper[3, 4]
Dilkü tasagi	*Orchis* sp.	Salep root[1, 3]
Demür dikeni	(?)	(?)
Zafran	*Crocus sativus* L.	Saffron[2]
Zencebil	*Zingiber officinale* Roscoe	Ginger[2]
Zeytun	*Olea europea* L.	Olive[2]
Süci		Wine[1]
Sarimsak	*Allium sativum* L.	Garlic[3]
Sogan	*Allium cepa* L.	Onion[1]
Sogan tohumu	*Allium cepa* L.	Onion seed[3]
Sakiz	*Pistacia lentiscus* L.	Mastic[1]
Simsim	*Sesamum indicum* L.	Sesame[3]
Seftalu	*Persica vulgaris* Miller	Peach[3]
Sekakul	*Eryngium campestre* L.	Eryngo[1, 2, 3, 4]
Salgam	*Brassica rapa* L. subsp. *rapa*	Turnip[1]
Salgum tohumu	*Brassica rapa* L. subsp. *rapa*	Turnip seed[1]
Fistik	*Pistacia vera* L.	Pistachio[1, 3]
Finduk	*Corylus* sp.	Hazel-nut[1]
Kasni	*Ferula* sp.	Galbanum[3]
Koz	*Juglans regia* L.	Walnut[3]
Kavun tohumu	*Cucumis melo* L.	Melon seed[1, 3]
Kebabe	*Piper cubeba* L.	Cubeb[1]
Kerefis	*Apium graveolens* L.	Celery[1]
Kerdeme	*Lepidium sativum* L.	Cress[1]
Su kerdemesi	*Nasturtium officinale* R. Br.	Water cress[1, 3, 4]
Kestane	*Castanea sativa* Miller	Chestnut[4]
Kesür	*Daucus carota* L.	Carrot[1, 3]
Kesür tohumu	*Daucus carota* L.	Carrot seed[3]
Kulkas	*Colocasia esculenta* Schott	Taro[3]
Kimnun	*Cuminum cyminum* L.	Cumin seed[1, 3]
Kendene	*Allium porrum* L.	Leek[1, 3]
Kenevür	*Cannabis sativa* L.	Hemp[1]
Habbetül hadra	*Pistacia terebinthus* L.	Terebinth berry[2, 3]
Köknar	*Abies* sp.	Fir[3]
Kuyeku otu	*Saturejae hortensis* L.	Savory herb[1]

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Turkish	Latin**	English
	Majorana hortensis Moench	Sweet marjoram[1]
Nar (tatli)	*Punica granatum* L.	Pomegranate[3] (sweet)
Na'na	*Mentha piperita* L.	Peppermint[1]
Helyun	*Asparagus officinalis* L.	Asparagus[2, 3]
Helyun tohumu	*Asparagus officinalis* L.	Asparagus seed[2, 3]
Hindistan kozu	*Cocos nucifera* L.	Coconut[2]
Yonca tohumu	*Trifolium arvense* L.	Clover seed[3]
Yund disi	*Colchicum autumnale* L.	Colchicum bulb[1]
Yantak	*Ononis spinosa* L.	Rest-harrow[1]

** Latin names give the source of herbal drugs.
1 increases sensuality.
2 arouses sexual desire.
3 increases sperm production.
4 strengthens penile erection.
(?) Modern Turkish equivalents could not be found, hence Latin and English names are given also.

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REFERENCES

1. Baytop, T. *Therapy with plants in Turkey* (Turkish), a publication of Istanbul University, (No. 3255), Istanbul, 1984.
2. Canpolat, M. *Edviye-i Müfrede*, a valuable medical work edited in XIV'th century (Turkish), Türkoloji Dergisi, 5(1):21-47, 1973.
3. *New Redhouse Turkish-English Dictionary*, Redhouse Press, Istanbul, 1979.
4. Spies, O. *Das türkische Drogen-und Medizinbuch des Ishaq ibn Murad*, Wiss. Z. Univ. Halle, 17(2-3):185-192, 1968.
5. Tuncer, H. *The Glossary of Wild Plants* (Modern Turkish translation of Ottoman editor Hayatizade Mustafa Fevzi Efendi's work), a publication of Turkish Ministry of Agriculture, Ankara, 1978.

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STANDARDIZATION OF *MAJOON-E-FANJNOSH*

M.A. Qasim, Sarfaraz Ahmad and M. Kamil

Fanjnosh is derived from the Persian word *Panjnosh* meaning five drugs[1]. These five drugs are *Khubs-ul-hadeed, Halela, Balela, Amla* and *Shahed.* Some authors are of the opinion that *Kalonji, Mastagi, Ood Hindi, Jauzbuwa, Qaranfal* and *Zanjabil* are also incorporated in *Majoon-e-Fanjnosh*[2]. It is also known as *Majoon-e-Khubs-ul-hadeed* as the *Khubs-ul-hadeed* is the chief ingredient of this compound formulation[1].

Majoon-e-Fanjnosh increases haemoglobin and has hepatotonic, aphrodisiac, retentive and diuretic actions. This drug is recommended for indigestion, liver ailments, anaemia, ascites, piles, spermatorrhoea and dropsy[1, 2].

The properties of the compound formulation are basically due to the action of incorporated ingredients and the drug is prepared by mixing the finally powdered 13 single medicines with concentrated sugar syrup or honey as base[2]. The ingredients with their botanical names, family and quantity are given in Table 1.

The actions of the compound formulation are due to the properties of incorporated single drugs. The *Khubs-ul-hadeed* (Iron oxide) which is one of the main ingredients of this drug is used after detoxification and for this it is ground to powder form and kept immersed in *Sirka naishakar* (sugarcane vinegar) or *Sharab-e-angoori* (brandy). The level of either of the two should be 5 cms above the level of the powder. After 14 days, the *Sirka naishakar* or *Sharab-e-angoori* is decanted, the powder is dried and fried in *Raughan-e-badam.* It helps in the treatment of anaemia[3] (anaemia is caused due to the nonformation of haemoglobin which is a complex protein, rich in iron), used in chronic bowel complaints, dyspepsia, amenorrhoea, dysmenorrhoea, intestinal worms, nervous diseases and neuralgia of the fifth nerve due to debility. *Halela,* one of the important ingredients may be used as tonic for the brain and vision, checks diarrhoea, piles, paralysis, headache, epilepsy, loss of memory, and *safra; siyah* variety is blood purifier. *Amla* fruit is acrid, cooling, refrigerant, diuretic and laxative. The dried fruit is useful in haemorrhage, diarrhoea and dysentery. In combination with iron, *amla* is used as a remedy for anaemia, jaundice and dyspepsia[4]. Acute bacillary dysentery may be arrested by drinking a *sharbat* of *amla* with lemon juice. *Balela* has antidiarrhoeal properties; with salt

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TABLE 1

S.No.	Unani Name	Scientific Name	Family	Quantity (gm)
1.	*Khubs-ul-hadeed Muddabir*	Iron oxide		80
2.	*Post-e-halela kabli* (*Chebulic myrobalan*)	*Terminalia chebula* Retz.	Combretaceae	120
3.	*Halela siyah* (*Chebulic myrobalan*)	*Terminalia chebula* Retz.	Combretaceae	120
4.	*Post-e-halela zard*	*Terminalia chebula* Retz.	Combretaceae	120
5.	*Amla* (*Emblic myrobalan*)	*Emblica officinalis*	Euphorbiaceae	120
6.	*Post-e-balela* (*Beleric myrobalan*)	*Terminalia belerica* Linn.	Combretaceae	120
7.	*Kalonji* (small fennel)	*Nigella sativa* Linn.	Ranunculaceae	20
8.	*Mastagi* (*mastich*)	*Pistacia lentiscus* Linn.	Anacardiaceae	20
9.	*Ood Hindi* (*agar*, eagle wood)	*Aquilaria agallocha* Roxb.	Thymeliaceae	20
10.	*Jauzbuwa* (nutmeg)	*Myristica fragrans* Houtt.	Myristicaceae	10
11.	*Qaranful* (*laung*, clove)	*Myrtus caryophyllus*	Myrtaceae	10
12.	*Zanjabil* (ginger)	*Zingiber officinale* Rose	Zingiberaceae	10
13.	*Asal* or *Qand safed*	Honey or White sugar syrup		2.5 kg.

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and long pepper, pulp of fruit is given in the form of electuary in cough, hoarseness, sore throat and dyspepsia. *Triphala,* consisting of equal parts of powdered *amla, halela* and *balela* is used as a laxative and in headache, biliousness, dyspepsia, constipation, piles, enlarged liver and ascites. *Kalonji* possesses anti-inflammatory, antiflatulent, emmenagogue properties and is a nervine tonic. *Mastagi* and *qaranfal* are antiflatulent, carminative and antiseptic in action. *Ood Hindi* is a nervine tonic, carminative, antiseptic and expectorant. *Jauzbuwa* is stimulant, carminative, astringent and aphrodisiac and is used in tonics and electuaries and forms a constituent of preparations prescribed for dysentery, stomach ache, flatulence, nausea, vomiting[4], malaria, rheumatism, sciatica and early stages of leprosy. Nutmeg contains proteins, Ca, P, Fe, V.O. and starch. *Zanjibil* is stimulant, appetizer, carminative and antiflatulent.

The drug *Majoon-e-Fanjnosh* is a semi-solid preparation, black in colour having undesirable smell with sweet taste. The solubility of the drug in alcohol and water is 54% and 55%. The *Majoon* was successively extracted and the extract is 1.64% in petrol, 0.16% in chloroform and in alcohol it is 4.68%. The pH of 1% and 10% solution in water is 4.9 and 4.4. Its bulk density and solid contents are 1.36 and 20% respectively. The total ash of this drug is 1.77% while water soluble and acid insoluble ashes are 0.33% and 0.66%. The volatile oil content in this drug is 0.1% (v/w). The saponification, iodine and acid values of the oil were performed and found 182, 85 and 159 respectively. Phenolics and terpenoids were qualitatively performed and found positive, while alkaloids, tannins, resins and Vitamin C were quantitatively estimated and their results are 0.029%, 1.35%, 0.89% and 0.06% respectively. Reducing, total reducing and non-reducing sugars in the *Majoon* is 0.92%, 30.92% and 30.00%. Crude fibre content and total nitrogen were also determined and found 2.14%, and 0.30%. Ash analysis of the drug shows the presence of Magnesium (Mg^{++}) 0.812, Calcium (Ca^{++}) 27.8, Iron (Fe^{++}) 0.555, Copper (Cu^{++}) 0.77 and Lead (Pb^{++}) 0.32 mg/gm of the ash.

Thin layer chromatography of the petrol, chloroform and alcoholic successive extracts were performed in different solvent systems. Petroleum ether fraction showed four spots with Rf values at 0.2, 0.33, 0.7, 0.96 and chloroform fraction two spots (Rf values 0.16 and 0.36) in benzene, ethyl acetate (95:5). One spot was developed in petrol and ether (1:1) with Rf values at 0.26 of petrol, 0.23 of chloroform and 0.18 of alcoholic extract.

In third solvent system that is benzene, ethyl acetate, alcohol (40:10:1.25), only 4 spots appeared with the Rf values at 0.43, 0.56, 0.68, 0.9 of the petrol extract while chloroform fraction showed three spots with Rf values at 0.18, 0.33 and 0.87.

The different single ingredients incorporated in this compound formulation will enhance the power of therapeutic effect with the help of synergic action and hence it will be better to use this compound

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medicine in place of single medicine.

The above chemical study gives the analytical characteristic of *Majoon-e-Fanjnosh* which may prove a prelude in fixing the chemical standards for this compound formulation. For example, the presence of oils or fat with specific nature which is evidenced by saponification, iodine and acid values. So the oil of the compound drug will have a definite unsaturation which will be proved by its iodine value. In this way TLC may also serve a very important marker in fixing the standards, as the appearance of spots has a definite Rf value in a fixed solvent system with respect to the drugs taken. So the values of all above chemical parameters will change by change or adulteration of the compound drug prepared.

REFERENCES

1. *Kitab-ul-Murakkabat,* H.S. Zillur Rahman, 1980, 168.
2. *National Formulary of Unani Medicine,* Ministry of Health and Family Welfare, 1981, 126.
3. *Human Physiology,* E. Babsky, *et al.,* Vol. 1, 1982, 70.
4. *The Wealth of India, Raw Materials,* CSIR, N. Delhi, 1969, Vol. VI, 478, Vol. III, 169.

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PHYSICO-BIOCHEMICAL CHANGES IN POTATOES IN RELATION TO STORAGE TEMPERATURE

Mohammad Wahid, S. Karar Haider, Hafiz Inayatullah, Abdus Sattar, Yusuf Ganai and K.M. Janjua

Potato cultivars (Cardinal, Ultimas, Desiree and Lale-Faisal) were stored at ambient room temperature (12-26°C) and 4°C for 12 weeks and investigated for physico-chemical changes. It was observed that sprouting initiated after 8 weeks which increased consistently during later storage. Highest sprouting occurred in Desiree and lowest in Ultimas at room temperature. No sprouting was observed at 4°C. Rotting was observed after first week which increased throughout storage. Rottage was highest in Ultimas while tubers of Lale-Faisal resisted to rot attack more than other cultivars in all storage conditions. Significant loss of moisture occurred with storage which was highest in Cardinal and lowest in Lale-Faisal. Desiree and Lale-Faisal cultivars contained highest amount of ascorbic acid which decreased significantly during storage. Total sugars were higher in Desiree and Lale-Faisal respectively which increased significantly ($P<0.05$) on storage.

Introduction

Potato due to its yield potential is generally called king of vegetables. Among the edible items, it has far greater values as a food crop. It is rated high as an energy food and furnishes about 81 k. calories per 100 gram[1]. The annual per capita consumption of potato in Pakistan is estimated 5-6 kg against 60-143 kg in the developed countries where no nutritional deficiencies are prevalent and the health of masses is generally good. Potatoes produce more food per unit area and time. It is one of the leading crops in the world, which provide cheap and nutritive food. It is wholesome and contains all essential constituents needed for maintaining proper health and vigour. Potato is a cheaper source of carbohydrates, vitamins (B, C), minerals and starch than cereals[2]. The area under potato crop in Pakistan was 62,938 hectares with a total production of 618,336 tonnes in the year 1985-86[3]. Potato is a highly perishable vegetable. Due to extreme temperatures, severe losses of this vegetable occur in storage. Few reports are available about performance of potatoes at varying

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temperatures in Pakistan. Present work was undertaken to study the effect of different temperatures on storage and sensoric qualities of important cultivars of potatoes.

Materials and Methods

Four varieties of fully mature potatoes were obtained from the Potato Section of Agricultural Research Institute, Mingora (Swat) in the month of October, 1986 and transported to Nuclear Institute for Food and Agriculture, Peshawar by road. After sorting for uniform shape and size, the tubers were washed in running tap water and divided into eight lots depending upon the treatment. Samples in each lot containing one variety, were kept at room temperature (12-26°C) and at 4 ± 2°C. The stored tubers were studied fresh and then at regular intervals. Some tubers in each treatment were marked in the beginning of the experiment and were kept separate at different storage temperatures (12-26°C, and 4°C). Their sprouting and rot attacks were studied after every two weeks' interval, averages were measured and the results were calculated in percentage[4]. Further, some tubers, in each treatment were marked for weight loss in the start of the experiment and kept separate for periodical determination of moisture loss during storage (12-26°C, and 4°C) at regular intervals. The results were calculated in percent. The biochemical assays for ascorbic acid and sugars were done according to AOAC[5]. The data regarding various physico-chemical changes were statistically analysed by the analysis of variance with LSD between treatments and storage intervals means[6].

Results and Discussion

Fresh potatoes were ungerminated but sprouting started after a storage period of 8 weeks which significantly increased ($P<0.05$) during extended storage period (Fig. 1). Sprouting was observed to be 80.9, 76.3, 88.8 and 80.0% in Cardinal, Ultimas, Desiree and Lale-Faisal cultivars at room temperature respectively during 12 weeks' storage. However, no sprouting was noted in any variety at 4°C. Samotus and Scigalski[7] reported that the extent of sprouting at room temperature was greater in potato tubers under high than at low humidity. Allen *et al.*,[8] showed that low temperature induced an earlier onset of sprouting and increased the total and individual sprout length per tuber. Leach[9] also observed excessive sprouting at 4.5°C.

Rottage studies indicated that at the start of experiment all samples were free of any fungal infestation but the attack of rot appeared after first week which increased significantly ($P<0.05$) throughout the storage. Rot attack reached to 18.6 and 3.6% in Cardinal, 27.0 and 10.6% in Ultimas, 23.4 and 8.8% in Desiree and 5.7 and 1.5% in Lale-Faisal varieties respectively at room temperature

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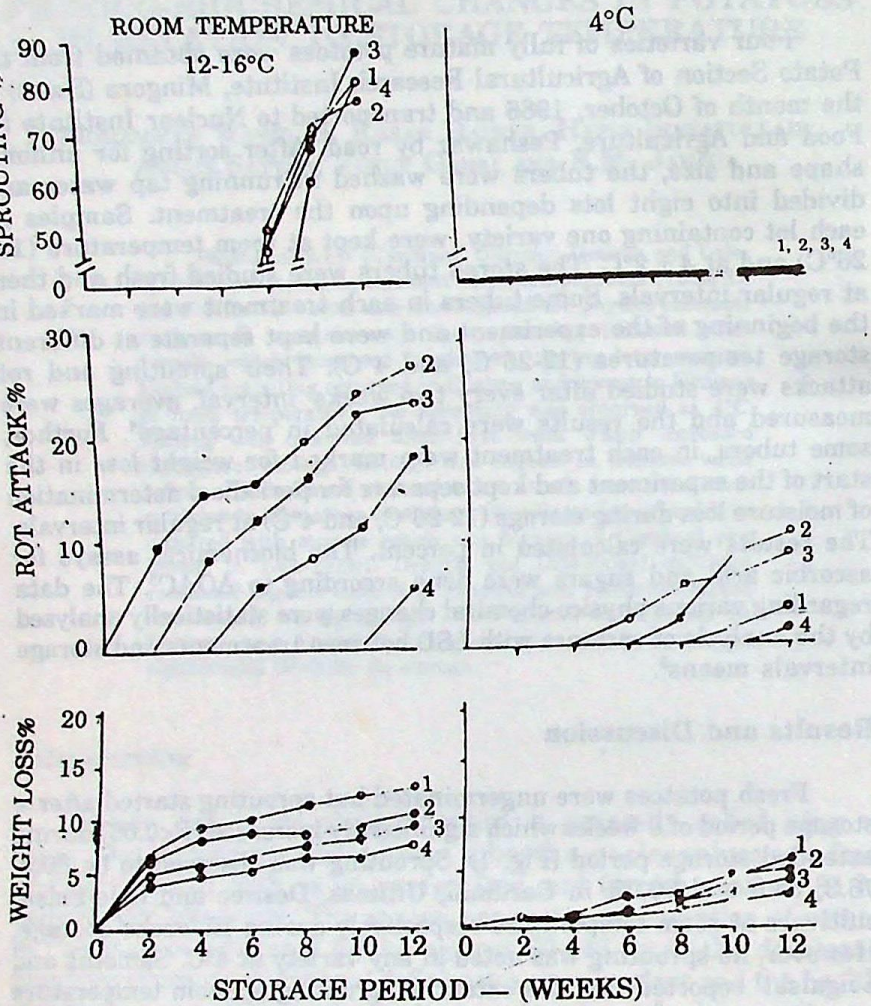

Fig. 1

Effect of storage and temperature on sprouting, rottage and weight loss in potatoes (1: Cardinal, 2: Ultimas, 3: Desiree, 4: Lale-Faisal).

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(12-26°C) and 4°C during 12 weeks storage (Fig. 1). Rotting is a major problem in potato tubers during storage. Our results are almost similar to the findings of Sellam *et al.*,[10] who reported that susceptibility of potato-tubers to *E. carotovora* increased when kept at 30°C rather than 5°C. Thomas *et al.*,[11] also reported similar results. However, some researchers found conflicting findings which might be due to different storage environments or nature of microbial infestation in storage. Miller[12] concluded that potatoes held at 24°C with 22% r.h. had long shelf life with a few tubers showing rot and shrivelling than those stored at 15°, 14° and 7°C. Croke[13] concluded that potato tubers kept at low temperature and high humidity, developed higher incidence of gangrene and rots than at high temperature and low humidity respectively.

Dehydration (weight loss) increased consistently due to the respiration and evaporation of potatoes during storage. In Cardinal, Ultimas, Desiree and Lale-Faisal the weight loss was 13.2, 10.5, 9.3 and 7.6% at room temperature (12-26°C) and 6.2, 5.5, 4.7 and 3.0% at 4°C respectively (Fig. 1). There was a significant loss of moisture in all the cultivars on storage. Shrinking and moisture loss from vegetables and fruits is an important factor during their prolonged storage. Walter[14] showed that weight loss in Russet Burbank potatoes at 45°F was less than at 52°F. Musil and Phorela[15] observed that moisture loss ranged from 3-24%, 10-20% and 11-91% in Krasara, Blanik and Amyl cultivars respectively when stored for a longer time at 2°C, and 95-95% r.h.

All the potato tubers contained considerable ascorbic acid, which is important from nutritional point of view. The ascorbic acid content ranged from 15.81 to 17.27 mg/100g (Table 1). There was a definite decrease of ascorbic acid in all the cultivars at room temperature (12-26°C) and 4°C. Fresh samples of Cardinal had about 15.81 mg/100g ascorbic acid which decreased to 14.15 and 12.57 mg/100g respectively at room temperature and 4°C after 12 weeks. The ascorbic acid content decreased from 16.41 to 13.71 and 13.87 mg/100g in Ultimas at room temperature and 4°C. Desiree and Lale-Faisal respectively contained 17.13 and 17.27 mg/100g ascorbic acid which decreased to 13.90 and 14.08 mg at room temperature, and 13.24 mg at 4°C after 12 weeks. Storage period had a significant decreasing effect on the vitamin content of potato cultivars ($P<0.05$). These findings are similar to the results of some investigators reported in the literature. Shekhar *et al.*,[16] noted that Kennebec tubers were higher in ascorbic acid than Russet Burbank, and when stored at 5.5°C for 4 weeks the ascorbic acid decreased sharply. Anitar *et al.*,[17] investigated the Bintje variety and found that the ascorbic acid was 8.2 mg/100g which decreased during storage at 7°C on 12 weeks but at 16°C and 28°C the vitamin increased. Similarly Staikov[18] reported that vitamin C dropped sharply from 30 mg to 10 mg/100g during 5 months when kept either in refrigerator (3-4°C) or in shallow trenches (4-10°C).

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TABLE 1

Ascorbic acid contents of potatoes during storage (mg/100g)

Temperature/ Cultivar	Storage period-weeks							Mean
	0	2	4	6	8	10	12	
Room temperature (12-26°C)								
Cardinal	15.81	15.23	14.67	14.42	14.51	14.29	15.14	14.72
Ultimas	16.41	15.49	14.87	14.53	14.48	14.23	13.71	14.81
Desiree	17.13	16.15	15.97	14.33	14.68	14.22	13.90	15.19
Lale-Faisal	17.27	16.20	16.11	16.03	15.47	14.98	14.08	15.73
4°C								
Cardinal	15.81	14.07	13.07	13.16	12.45	12.68	12.57	13.04
Ultimas	16.41	14.19	14.35	14.48	14.44	14.81	13.87	14.65
Desiree	17.13	13.85	16.05	14.68	14.45	14.00	13.24	14.77
Lale-Faisal	17.27	15.03	14.48	14.34	14.06	13.26	13.04	14.49
Total Mean:	16.5^{a}	15.02^{b}	14.93^{b}	14.49^{c}	14.31^{c}	14.05^{d}	13.57^{d}	

Values followed by the same letter are not significantly different ($P<0.05$).

Total sugars also showed a significant increasing trend during storage and ranged from 5.52 to 7.23 g/100g in fresh investigated potato cultivars. The fresh Cardinal and Ultimas varieties contained 5.52 and 6.22 g/100g of total sugars which increased to 9.10 and 9.60 g/100g at room temperature, and 9.85 and 12.70 g/100g at 4°C. In Desiree and Lale-Faisal total sugars increased from 7.14 and 7.23 g/100g to 10.14 and 11.30 g/100g at room temperature and 14.00 and 14.93 g/100g at 4°C, respectively. Storage at lower temperature had significant ($P<0.05$) increasing effects on total sugars contents in the investigated potato cultivars (Table 2). Szebiotko *et al.*,[19] reported that both reducing and total sugars exhibited considerable variations at different storage temperature, and concluded that during storage at 2°C, the glucose and fructose increased but sucrose decreased. Sabhlok[20] elucidated that total, reducing and sucrose increased at low temperature but at room temperature, these showed lower values. Yoon *et al.*,[21] expressed that total sugars showed only small increase in simple warm warehouse but reducing and total sugars showed no differences at low temperature. These results are congruent to the findings of other workers with minor variations which may be due to varietal characteristics and storage environments.

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TABLE 2

Total sugars contents of potatoes during storage (%)

Temperature/ Cultivar	Storage period-weeks							Mean
	0	2	4	6	8	10	12	
Room temperature (12-26°C)								
Cardinal	5.52	6.90	7.40	8.10	8.36	8.82	9.10	7.74
Ultimas	6.22	6.74	5.94	7.01	7.28	8.14	9.60	7.27
Desiree	7.14	7.85	8.10	8.46	9.38	9.82	10.14	9.55
Lale-Faisal	7.23	7.72	8.08	8.63	9.40	10.24	11.30	8.94
4°C								
Cardinal	5.52	7.40	8.87	8.42	8.44	8.87	9.85	8.19
Ultimas	6.22	10.02	10.54	11.38	11.94	12.68	12.70	10.78
Desiree	7.14	10.74	11.18	12.67	13.15	13.19	14.00	11.72
Lale-Faisal	7.23	10.24	10.71	12.03	12.26	13.65	14.93	11.57
Total Mean:	6.52^{f}	8.45^{e}	8.85^{de}	9.58^{c}	10.38^{bc}	10.67^{b}	12.20^{a}	

Values followed by the same letter are not significantly different ($P<0.05$).

REFERENCES

1. Pellet, P.L. and Shadarevian, S., *Food Composition Tables for use in the Middle East,* Am. Univ., Beirut, pp. 21, (1970).
2. Shah, M.A. and Khan, N., Status paper on potato in Pakistan, *Pak. Agri. Res. Council,* Islamabad, pp. 1-3, (1984).
3. *Agricultural Statistics of Pakistan,* Ministry of Agriculture and Cooperatives, Government of Pakistan, (1986).
4. Khan, I. and Wahid, M., Food Preservation by Irradiation, *IAEA,* Vienna, 1:63-70, (1978).
5. A.O.A.C. Association of Official Analytical Chemists, 14th Ed.
6. Gomez, K.A. and Gomez, A.A., *Statistical procedure for agricultural research,* The International Rice Research Institute, Philippines, (1976).
7. Samotus, B. and Scigalski, A., *Potato Abs.,* 1(1-3):57, (1976).
8. Allen, J.E., Bean, N.J. and Griffith, L.R., *Potato Res.,* 21:244-255, (1978).

Channel eGangotri Urdu

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9. Leach, S.S., *Am. Potato J.*, 55:677-684, (1979).

10. Sellam, M.A., Rushidi, M.H. and Abd-El-Aal, S., *Potato Abs.*, 6(8):150, (1981).

11. Thomas, P., Srirangarajan, A.N., Joshi, M.R. and Janave, M.T., *Potato Res.*, 22:261-278, (1979).

12. Miller, M., *J. Food Sci.*, 45:716-717, (1981).

13. Croke, E., *Annals Appl. Biol.*, 96:378-379, (1981).

14. Walter, C.S., *Am. Potato J.*, 42:246-248, (1965).

15. Musil, J. and Phorela, M., *Potato Abs.*, 5(8):147, (1980).

16. Shekhar, V.C., Iritani, M.W. and Manguson, J., *Am. Potato J.*, 56:225-235, (1980).

17. Anitar, L., Andre, V. and Klaasje, H., *Potato Res.*, 28:271-278, (1985).

18. Staikov, G., *Potato Abs.*, 4(8):153, (1979).

19. Szebiotko, K., Grzeskowiak, Z., Piasccki, M., Piorunski, J. and Malcherek, T., *Potato Abs.*, 1(4-6):133, (1976).

20. Sabhlok, J.P., Dissertation on potato storage, *Abstracts International*, Ohio Univ., U.S.A., 36(6):2700-2701, (1978).

21. Yoon, I.W., Sony, K., and Han, P.J., *Res. Report of the Office of Rural Development*, Korea, 19:45053, (1979).

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For information and registration:

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From right: Hakim Mohammed Said, Dr. S. Mahdihassan, Syed Hashim Raza, Prof. Jurgen H. Hohnholz and Dr. M.A. Kazi.

On March 28, 1992, Dr. S. Mahdihassan, an eminent scientist and distinguished scholar of Pakistan became a centenarian. To mark this occasion, Hamdard Foundation Pakistan arranged a Sham-i-Hamdard (Soiree) and his monograph *Alchemy and Sufism* a publication of Bait al-Hikmat was launched.

Dr. Mahdihassan is still contributing articles to *Hamdard Medicus* and we offer our congratulations to him on his 100th birthday.

The Editor

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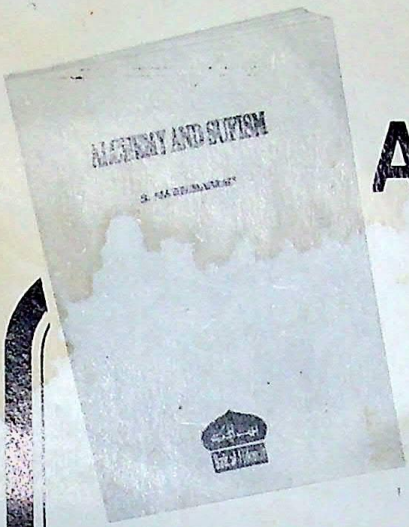

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